

NAS DATA STANDARDIZATION PROCEDURES

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ABSTRACT

This document provides advice on how to create application-independent data standards for representing commonly shared National Airspace System (NAS) data. It describes procedures for initiating, developing, approving, registering, and maintaining NAS data standards as items under NAS configuration control. The procedures support FAA data standardization as established by FAA Order 1375.1C, *Data Management Policy*, and may be used as guidance to FAA-STD-060, *Data Standard for the National Airspace System*.

The document was produced by FAA's NAS Information Architecture Committee (NIAC), which is chartered by the NAS Configuration Control Board (CCB) to be responsible for developing NAS data standards for CCB approval. It is organized as follows:

- Chapter 1 describes the purpose and objectives of the NAS data standardization process.
- Chapter 2 gives an overview of the entire process.
- Chapter 3 discusses the roles and responsibilities of participants in the process.
- Chapter 4 gives participants a basic understanding of the essential concepts and tools used in the process, including the ISO/IEC 11179-compliant FAA Data Registry (FDR) in which the data standards are maintained.
- Chapter 5 describes the steps needed to develop a proposed standard, including creating and registering metadata, collaborating with subject matter experts, and compiling a case file to support the proposed standard.
- Chapter 6 describes the steps needed to advance the proposed standard through the NAS Change Proposal (NCP) pre-screening and clearance process toward final approval and publishing in the FDR as a NAS-level data exchange standard.

ACKNOWLEDGEMENTS

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The document incorporates many of the ideas brought forth over time by members of the FAA's NAS Information Architecture Committee, all of whom believe in the goal of establishing a permanent NAS data standardization program in FAA. It is everyone's hope that this document will play a major part in helping FAA to achieve that goal.

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1.0 GENERAL INFORMATION

1.1 Introduction

Standard data is the cornerstone of the information infrastructure that supports the systems and the overall mission of the Federal Aviation Administration (FAA). Sharing of information is critical to the establishment of National Airspace System (NAS)-wide information services envisioned in the [NAS Architecture](#). Standard data will help the NAS to operate in an integrated, effective, and efficient manner. In December 2001, the [NAS Configuration Control Board \(CCB\)](#) approved [FAA-STD-060, Data Standard for the National Airspace System](#), for the purpose of establishing application-independent data exchange standards to be applied during the development and support of software systems. Each individual data standard covered by FAA-STD-060 is a description of a data element shared among NAS information systems, and is portrayed through a common set of metadata (data *about* data). The metadata set complies with recommendations set forth in [ISO/IEC 11179](#) and follows best practices for managing shareable data.¹ The individual data standards are maintained in the [FAA Data Registry \(FDR\)](#) tool. For FAA-STD-060 to provide the benefits for which it was intended, the individual data standards must be well constructed, uniformly specified, widely coordinated and accepted by the user community. The overall goal of this document is to ensure that all future data standards do in fact meet these requirements.

1.2 Purpose

1.2.1 This document contains the procedures for initiating, developing, approving, registering, and maintaining NAS data standards in the FDR as items under NAS configuration control. A data standard provides the framework for how commonly used data will be described for sharing across NAS information systems. Other document(s) will cover procedures for implementing approved standards. [FAA-STD-025, Preparation of Interface Documentation](#), is currently being revised to address, among other things, the use of these data standards in NAS application interface requirements documents (IRD) and interface control documents (ICD).

1.2.2 The procedures contained in this document support FAA data standardization as established by [FAA Order 1375.1C, Data Management Policy](#), and may be used as guidance to FAA-STD-060. Use of these procedures will improve the consistent and uniform identification and standardization of data.

1.2.3 The context diagram shown in Figure 1 presents an overall picture of the activities supporting the standardization of data within this document.

¹ “For systems to be truly open, data must be portable and shareable within and among these various application environments, which span localized and distributed networks. For data to be shareable, both the users and owners of data must have a common understanding of its meaning, representation, and identification. To understand the meaning of any data, the descriptions of the data must be available to the users from, for example, a Data Element Registry. Data must be adequately described and users must have a convenient way to obtain these descriptions. Data Element Registries provide a way to organize the content and representation of data elements so that data descriptions are consistently specified and can be easily located by data designers and users. Uniform specification of data facilitates data retrieval, data exchange, and consistent use of data throughout the Software Development Life Cycle. The units of information with normalized meanings and formats are known as ‘standardized data elements.’” -- *ISO/IEC STANDARD 11179-1, Specification and Standardization of Data Elements*.

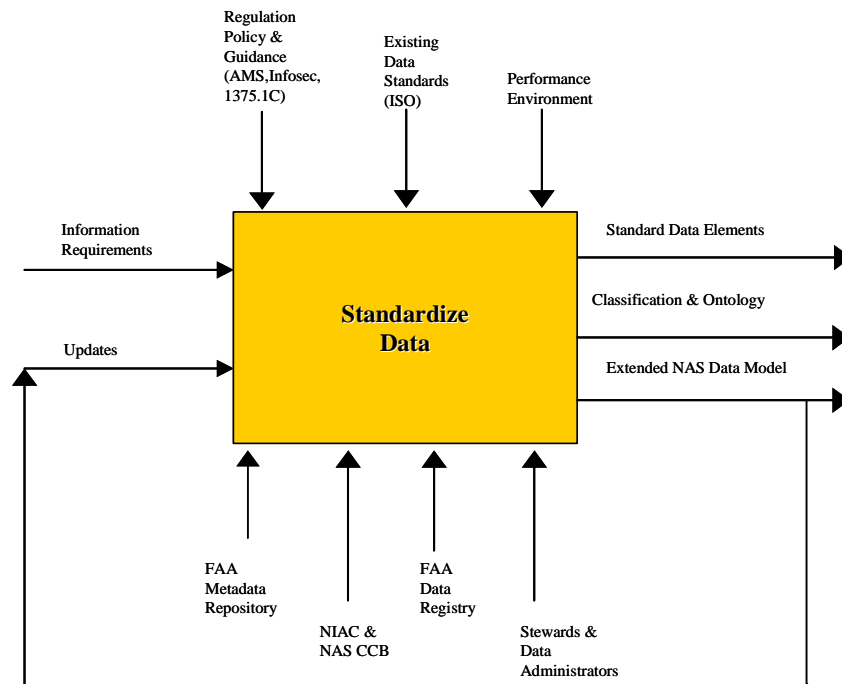


Figure 1: Standardize Data

The remainder of the document is organized around the fundamental activities required to standardize NAS data as follows:

- Chapter 2 provides an overview of the entire data standardization process.
- Chapter 3 discusses the roles and responsibilities of participants in the process.
- Chapter 4 gives participants a basic understanding of the essential concepts involved in creating data standards, and describes tools that the FAA provides to help with the work.
- Chapter 5 discusses in more detail the steps required to develop a proposed standard, including creating and registering metadata, collaborating with subject matter experts, and compiling a case file to support the proposed standard.
- Chapter 6 discusses in more detail the steps required to advance the proposed standard through the NAS Change Proposal (NCP) pre-screening and clearance process toward final approval and publishing in the FDR as a NAS-level data exchange standard.

1.3 Applicability and Scope

1.3.1 This document is intended to guide users and stewards of systems in the NAS on how to develop application-independent standards for exchanging commonly shared NAS data. For policy and requirements for data standardization, refer to Order 1375.1C and FAA-STD-060.

1.3.2 The FAA's [Office of Information Services](#) provides the agency-wide policy and guidance for data standardization, and the [NAS Information Architecture Committee \(NIAC\)](#) is the group chartered by the

NAS CCB to manage the standardization process for NAS data. The NAS CCB approves the standards and maintains them as NAS-level requirements.

1.3.3 To maximize data sharing across systems in the NAS, data standards must be registered, approved, and stored in the FDR. The FDR is the authoritative source of FAA data standards, and is the mechanism to be used in the data standardization process.

1.3.4 Functional and Component level dictionaries and repository tools should complement the NAS level of functionality. These tools may provide internal requirements not supported by the FAA tools, and they may support the implementation of approved data standards.

1.4 Objectives

1.4.1 The objective of NAS data standardization is the use and reuse of data standards throughout the NAS in support of interoperability, data sharing, system design and development, system integration, and business process improvements. Specific objectives are:

- 1.4.1.1 Enhance information system interoperability by reducing the requirements to translate and transform data.
- 1.4.1.2 Reduce the cost and time to develop, implement, and maintain systems.
- 1.4.1.3 Provide uniform descriptions and representations of commonly shared data.
- 1.4.1.4 Improve data integrity and accuracy.
- 1.4.1.5 Control data redundancy.
- 1.4.1.6 Document and maintain approved data standards in the FDR.
- 1.4.1.7 Use applicable international, national, and Federal standards, where appropriate.
- 1.4.1.8 Contribute toward the development and maintenance of those portions of the [FAA Data Architecture](#)'s Corporate Data Model that depict the NAS information requirements.

2.0 DATA STANDARDIZATION PROCESS OVERVIEW

2.1 Introduction

The NAS Data Standardization process is composed of two parts: standards development and standards approval. Standards development is characterized by research and analyses of candidate data standards, whereas the approval process consists largely of vetting the proposed standards and reaching consensus.

2.2 Standards Development

Any party that perceives a need to standardize a data element or data concept can initiate the development process. This “need” can be driven by a system engineering action such as a new system development or a system modernization. Actions following this need declaration are illustrated in Figure 2.

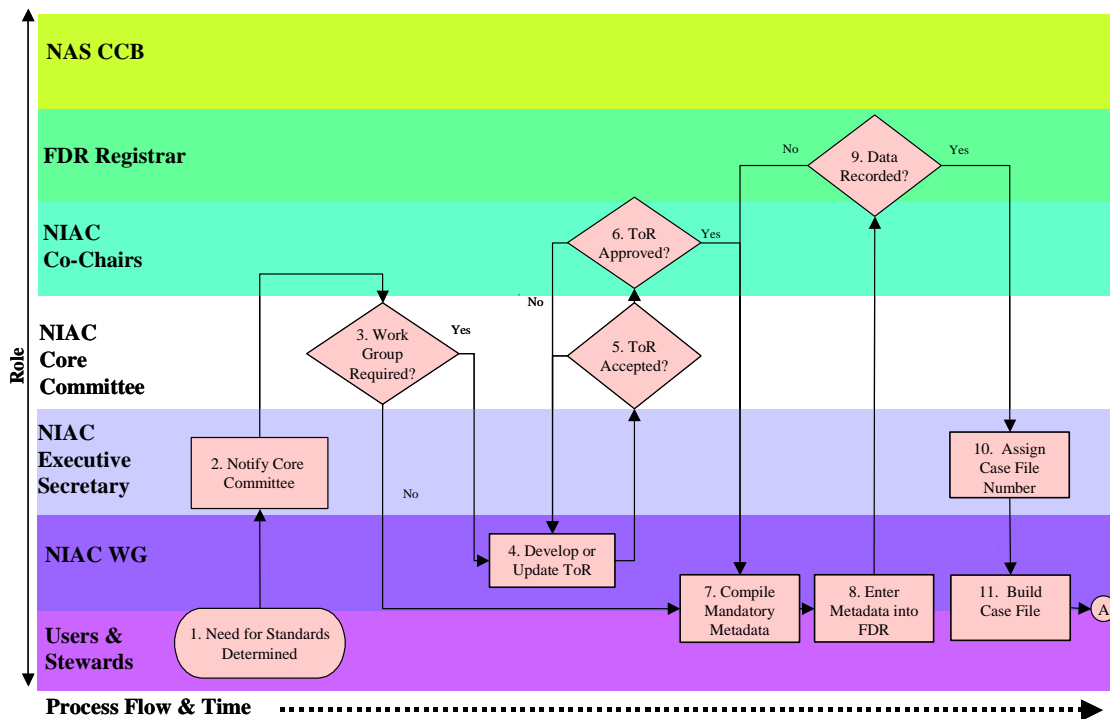


Figure 2: Standards Development Process

The need for a standard must be reviewed against the FDR to determine if another data element that might fulfill the specific need has already been standardized. If so, the initiator—ordinarily a steward or user of the data—is encouraged to adopt the existing standard for the specific use, and register the system involved with the [FAA Metadata Repository](#) (MDR) so that the system steward may be kept informed of any potential actions affecting the given standard. Data elements and other administered

components² that are data standards or potential candidates for standardization are registered in the FDR. Legacy and planned information systems are registered in the MDR. If applicable data elements have been registered but not standardized, then regardless of their status, the initiator should find this information to be a good basis on which to commence a standardization effort. Finally, if there is no information documented in either registry, the initiator will have a basis for proceeding to standardize his/her data elements.

The initiator then contacts the NIAC Executive Secretary, who notifies the NIAC Core Committee of the potential standardization effort. The Core Committee, a group of people who represent the various Lines of Business (LOB) of the FAA, will determine whether a Working Group of subject matter experts (SME) is needed to help develop the standard, based on the size and complexity of the standardization task. If the Core Committee concurs, the Working Group is formed ad hoc with a common interest in the proposed data standard. A [Terms of Reference \(ToR\)](#) contract that describes the group's composition, leadership, interest, products, and goals is developed, reviewed by the Core Committee, and approved by the NIAC Co-Chairs. In the event that a Working Group is not required, the steward or user who suggested the need for a standard will be directed to continue with the process as an individual.

The development process now expects that either the individual initiator or Working Group will compile the [mandatory metadata](#) as prescribed by the FDR. When these registry requirements are complete, the Executive Secretary assigns a case file number and the case file continues as an authorized NIAC activity. The [case file documents](#) are completed for entry into the approval process.

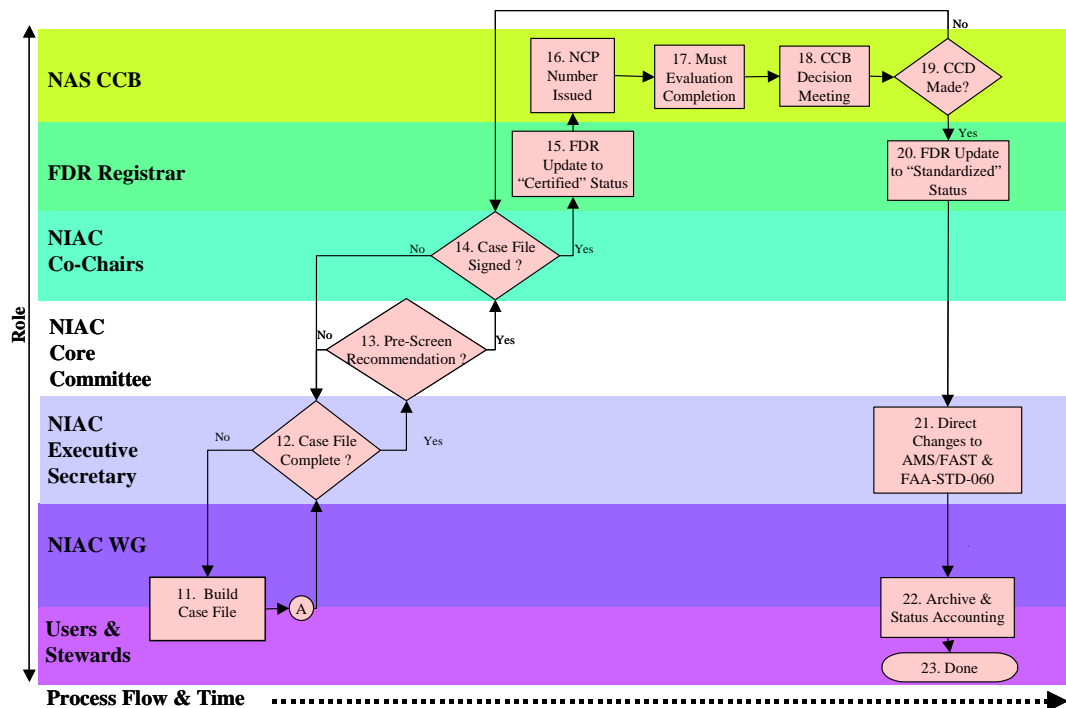


Figure 3: Standards Approval Process

² Administered components are any metadata components that are managed in an ISO/IEC 11179-compliant data element registry, such as the FDR, and are further discussed in section 4.2.

2.3 Standards Approval

The approval process is designed to qualify and formally review proposed data standards and their supporting material. Once reviewed and unanimity in metadata documentation is achieved, a standards decision may be made by the NAS CCB. Figure 3 graphically illustrates the steps and actions of this process.

The process describes moving the proposed data standard through the examination, review, and approval steps as a **case file**. The case file is an artifact for handling configuration management items. Traditionally, the case file describes proposed changes to a system's hardware or software baseline. In this process, the case file describes proposed changes to metadata. Note that any number of proposed data standards might be submitted in a single case file.

In the earlier discussion, the initiator (data steward or other user) or the Working Group compiled the case file. The case file is a collection of information about the proposed standard(s) with any relevant supporting materials such as a) related data elements; b) results of collaboration among stakeholders; c) documented requirements for the data standard(s); d) a relevant data model or system data blueprint; and e) an updated NAS data model or mosaic. The whole package is forwarded to the NIAC Executive Secretary for a completeness review and processing.

The Executive Secretary then presents the case file to the NIAC Core Committee members for pre-screening review. The Core Committee examines the material in the case file for completeness with respect to each member's LOB. If there are no issues for resolution, the package is presented to the NIAC Co-Chairs for signature and submitted to the NAS CCB Control Desk. The Control Desk handles the CCB administrative actions and the staff issues and assigns a NCP number and sets up the **must evaluation**. The must evaluation is a final screening by NAS stakeholders. Issues must be evaluated and resolved before a case file is presented to the CCB for approval. Once approved by the CCB, a Configuration Control Decision (CCD) is announced, and a new FAA standard is established.

Various administrative and registration statuses of the proposed data elements in the FDR have been assigned by the FAA Data Registrar and updated throughout the process. Now, as the case file exits the CCB process, the Registrar is alerted to the event and will change, as appropriate, the status of the data elements to "standardized." The case file then is returned to the Executive Secretary for action that will include announcements to the [FAA Acquisition Management System \(AMS\)](#) and the [FAA Acquisition System Toolset \(FAST\)](#) as to the changes introduced in the FAA-STD-060, which is the formal document supporting the data standards. The case file is then archived, and the initiator or the Working Group completes the cycle by performing the housekeeping task of status accounting or closing the books, as may be appropriate.

3.0 ROLES AND RESPONSIBILITIES

3.1 Introduction

Development of NAS data standards requires participation across all NAS functional communities. This chapter identifies the key participants and their roles and responsibilities in the NAS data standardization process.

3.2 Participant Roles and Responsibilities

3.2.1 NAS Configuration Control Board

The NAS CCB is the authoritative decision making body for all proposed NAS data standards. For detailed information on the operation of the CCB, refer to [NAS CCB Charters and Operating Procedures](#).

3.2.2 NAS Information Architecture Committee

The NIAC is the group chartered by the NAS CCB to manage the standardization process for NAS data. For more information on the operation of NIAC, refer to its [Charter and Operating Procedures](#).

3.2.3 NIAC Co-Chairs

The NIAC Co-Chairs are the three designated FAA executives who must approve the products and output of the NIAC. They act as pre-screening authority for changes presented to the NIAC, including signing NAS data standard case files before they are submitted to the NAS CCB. They approve the ToR contracts with the NIAC Working Groups, and they ensure that implementation actions assigned to the NIAC are completed as specified in CCDs.

3.2.4 NIAC Core Committee

The NIAC Core Committee functions as a designated representative of the FAA's LOBs who participate in the NAS data standardization process. The Core Committee is responsible for pre-screening case files and coordinating the activities of NIAC Working Groups. They advise and counsel the Co-Chairs to ensure that all technical, quality assurance, interface, schedule, cost, financial, policy, safety impacts, supportability, and life cycle implications are considered when making a decision on proposed changes.

3.2.5 NIAC Executive Secretary

The NIAC Executive Secretary facilitates and supports the Working Group activities, including assistance with meeting logistics and collaboration tools. The Executive Secretary has the key administrative role of monitoring and tracking the progress of the Working Groups and managing relations with the NAS CCB.

3.2.6 Data Steward

A data steward manages the development, standardization, and certification of data within an assigned area of responsibility. A data steward is responsible for the accuracy, reliability, quality, and currency of descriptive information (metadata) about data in his/her assigned area. Every established data standard will have a steward assigned who will be responsible for maintaining that standard throughout its life cycle. If changes are proposed to a standard, the appropriate data steward will review and consider comments and recommendations.

Data stewards are usually responsible for the data in specific information systems and are SMEs for the data within the information systems they are assigned. Data stewards play an essential role in the creation of NAS data standards by working with the FAA Data Registrar to resolve data integration issues, assign data element names, write definitions, specify business rules, identify sources of data, and establish data quality, security, and retention requirements. Data stewards are encouraged to submit candidate data elements for registration and standardization and to participate in NIAC Working Groups that are involved in their specific subject areas.

Data stewards will perform the duties assigned to them by FAA Order 1375.1C. The data steward is also responsible for managing and transferring appointments as necessary and will update the FDR and MDR accordingly. Refer to the Order for more information about stewardship assignment and responsibilities.

3.2.7 FAA Data Registrar

The FAA Data Registrar, or Registrar, is the person dedicated to the control of data standards and works under direction of the NIAC Co-Chairs for NAS data.

The Registrar provides overall technical direction of FDR operations in accordance with ISO/IEC 11179 and FDR policies and procedures.

The Registrar promotes the reuse and sharing of data in the FDR within and across functional areas and among external interested parties.

3.2.8 Working Groups

The basic organization for the compilation and creation of a case file of proposed data standards is the Working Group. The Working Group operates under a ToR contract with NIAC and is led by a chairperson who has the managerial responsibilities to generate and follow up on the case file. There is no requisite size for a Working Group, but the composition should represent those systems in the NAS that have a vested interest in the metadata under evaluation.

4.0 DATA STANDARDS CONCEPTS AND TOOLS

4.1 Introduction

This chapter describes the key components of the standardization process infrastructure and explains how they are used to support the collection, validation, and documentation of NAS data requirements. Key components include:

- FAA Data Registry – FDR
- FAA Metadata Repository – MDR
- FAA Data Architecture
- Data Standardization Requirements Information Sources
- Data Modeling Tools
- Groupware Collaboration Tool – CDIMS

4.2 FAA Data Registry

The FAA Data Registry is the heart of the infrastructure. It is a tool for recording, publishing, and maintaining metadata about application-independent data standards. It provides information about the precise meaning of NAS data,³ and it provides a place to capture information during the development of data standards. It is the authoritative source for FAA data standards. The first part of this section discusses important concepts and definitions with which one should be familiar in order to understand how the FDR is used to create and maintain data standards.⁴

4.2.1 ISO/IEC 11179

FDR is based on the ISO/IEC 11179 standard (ISO = International Organization for Standardization, IEC = International Electrotechnical Commission) entitled *Specification and Standardization of Data Elements*.⁵ The purpose of the ISO/IEC 11179 standard is to support the identification, definition, registration, classification, management, standardization, and interchange of data elements and to promote the sharing and exchange of data throughout the international community.

This standard has six parts:

- Part 1: Framework for the specification and standardization of data elements
- Part 2: Classification for data elements
- Part 3: Basic attributes of data elements
- Part 4: Rules and guidelines for the formulation of data definitions

³ Note: The FDR has been established as the Registry for both NAS and Non-NAS data standards. Non-NAS data standardization procedures are defined in a separate document.

⁴ Material in this section is derived from: *Data Element Registry User's Guide and Reference V1.0*, March 2001 by Gail Wright, Oracle Corporation.

⁵ The ISO/IEC 11179 *Specification and Standardization of Data Elements* document is a standard under revision by the Joint Technical Committee 1 (JTC1) Data Management and Interchange Subcommittee 32 (SC32).

Part 5: Naming and identification principles for data elements

Part 6: Registration of data elements

4.2.2 Administered Component

An **administered component** is an object that requires naming, identification, and administration (management). The FDR supports the following administered components:

- Data Elements
- Data Element Concepts
- Value Domains
- Conceptual Domains
- Classification Schemes

All of the components are discussed more thoroughly in the sections that follow. Figure 4 is a high-level model showing how the first four components are related. These four are integral to specifying data elements, whereas classification schemes are used to organize them.

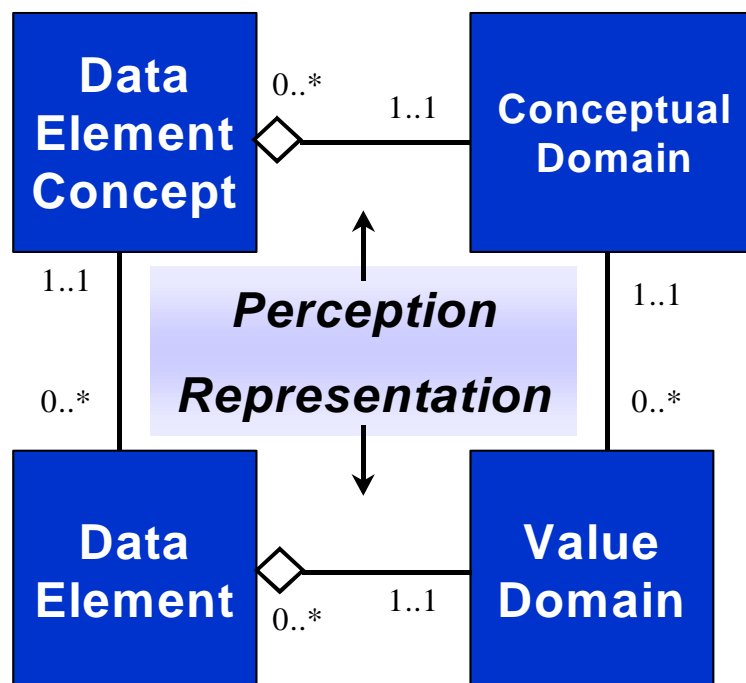


Figure 4: ISO/IEC 11179 Meta Model

4.2.3 Data Element

A **data element** is a unit of data that in a certain context is considered indivisible. Often, the terms “variable,” “code,” and “field” are used synonymously to mean a data element (e.g., Person Name, Person Age, Hospital ID, and Airport Elevation).

Derived data elements (also called complex data elements) are a special grouping of data elements and have a **derivation type** as illustrated in Figure 5 below.

Deriv. Type	Derived DE	Component DE's	Derivation Rule
Compound	Mailing Address	Street Address City State Zipcode	Grouping of Data Elements with a Display Order
Concatenation	Telephone Number	Phone Area Code Phone Exchange Phone Instrument	Grouping of Data Elements with a Display Order and Concatenation Character
Object Class	Person	Person ID Person First Name Person Last Name Person Age Person Sex	Grouping of Data Elements with optional Methods
Calculated	Person Annual Salary	Person Weekly Salary	Data Elements with a Derivation Rule (e.g. PAS = PWS * 52)
Recoded	Employment Indicator	Person Age Worked Last Week	Data Elements with a Complex Derivation Rule (e.g. EI=Yes when Age >=15 and Worked Last Week = Yes).

Figure 5: Derived Data Element

Furthermore, two data elements can be related to each other with a specified relationship (e.g., Part-of, Similar To, etc.).

4.2.4 Data Element Concept

The difference between a data element and a **data element concept** is that a data element has a physical representation (data type, maximum length, interchange format, unit of measure, possibly valid values, etc.), while a data element concept does not have a physical representation. A data element concept is just the *idea or perception* of the data element, e.g., “I am thinking of Person Income, but I cannot tell

you if it is represented in dollars or yen.” Data element concepts are useful for grouping similar data elements, and they may be used in a process for harmonizing data elements.

A data element concept consists of an **object class** and **property**. An object class is a thing or abstraction in the real world for which one would want to record information. It is much like an “entity type” in relational terms, e.g., Person, Organization, or Airport. A property is a unit of information about an object class. It is much like an “attribute” in relational terms, with the important exception that a property does not have a specified representation, e.g., Age of a Person, Sex of a Person, Number of Employees in an Organization, Elevation of an Airport. A data element concept’s object class and property determine its name.

Concepts can be related to each other, and the **relationship** between the data element concepts can be specified (e.g., Part-of, Similar To, etc.).

Note: In the FDR, a “data concept” is the same as the “data element concept.”

4.2.5 Value Domain

A data element is represented by a **value domain**. A value domain establishes the permissible values that can be used to represent a data element. A value domain has a **data type** (e.g., string, integer, date) and, optionally, a **unit of measure** (e.g., feet, miles, dollars) and an **interchange format** or layout of a representation for data interchange (e.g., YYYYMMDD for representing a date). A value domain can be **enumerated** (specified through a list of at least two individual permissible values) or **non-enumerated** (specified by a range of numbers, set of rules, formula, procedure, etc.).

Permissible values are valid values for an enumerated value domain. The permissible value is represented by a permissible value and a **value meaning**. An example would be “AL” (permissible value) and “ALABAMA” (value meaning) for the “Postal U.S. State” (value domain). Value meanings may be maintained and reused, such as “ALABAMA” (value meaning) also being used for “FIPS U.S. State” (value domain) with a permissible value of “01.”

Value domains can be related to each other and the relationship between the value domains can be specified (e.g., Part-of, Similar To, etc.).

Note: In the FDR, the term “valid values” is the same as “permissible values.”

4.2.6 Conceptual Domain

A **conceptual domain** is to a value domain as a data element concept is to a data element. While a data element concept does not have a value domain, it does have a conceptual domain without specific physical representations. A conceptual domain is the *perception* of a value domain and may be associated with items (meanings) that belong to the domain, but without their physical representations (valid values). To illustrate, one might say, “I am thinking of States of the United States. The states are Alabama, Alaska, Arkansas, etc., but I do not know if they are represented by Postal Codes (e.g., AL, AK, AR) or by FIPS Codes (e.g., 01, 02, 04).”

Instead of assigning permissible values to a conceptual domain, only value meanings may be assigned. To illustrate, one might say, “I am thinking of a Value Domain for U.S. State, but I cannot tell you if it is represented by Postal codes or FIPS codes, but I can tell you that it is made up of the following states (value meanings): Alabama, Alaska, Arkansas, etc.”

4.2.7 Classification Scheme

A **classification scheme** (CS) is used to classify or group data elements in order to organize them and make them easier to find and analyze. There are many kinds of schemes, including keywords, thesauri, taxonomies, ontologies, etc. A CS has a **classification scheme type** (e.g., taxonomy or keyword), and it is made up of **classification scheme items** (CSI) that may be hierarchical. The CS-CSI pair may be associated with zero or more data elements, and a data element may be associated with zero or more CS-CSI pairs.

The primary scheme in use in the FDR is called the [NAS Data Classification Scheme](#). It is a taxonomy composed of a set of keywords arranged in a shallow hierarchy from general to more specific descriptors and is designed to support the analysis of and access to the descriptions of NAS data recorded in the registry.

4.2.8 Context

A **context** is an important concept in the FDR, and it serves many purposes. The ISO/IEC 11179 standard defines a context as a “designation or description of the application environment or discipline in which a name is applied or from which it originates.” Context could be an organization or business area, a project, an application, or other designation. The idea is that an administered component is defined and managed within one or more contexts. A context may be assigned to each administered component name and related definition.

4.2.9 Stewardship, Registration, and Administration of Data Elements

The ISO/IEC 11179 standard provides a standardization process where data elements are formally submitted to a **registration authority** for standardization. There are three important roles and functions that are part of this process: stewardship, registration, and administration.

4.2.9.1 Stewardship. Each data element has a data steward who is responsible for the metadata quality of an object and is the point of contact for a given data element. (Note: This person does not necessarily create or maintain the metadata.) The data steward belongs to an organization. An organization can be identified at any level (e.g., agency, program area, staff area, or project); however, the FDR does not store the hierarchical organization chart.

4.2.9.2 Registration Status. When a data element is registered, it must conform to ISO/IEC 11179 standard and FDR requirements. ISO/IEC 11179 specifies the valid values of registration status as:

- **Incomplete:** The registered data component does not contain all Mandatory Attribute values.
- **Recorded:** The registered data component contains all Mandatory Attribute values, but the contents may not meet the quality requirements specified in ISO/IEC 11179 and FDR procedures.

- **Certified:** The recorded data component has met the quality requirements specified in ISO/IEC 11179 and FDR procedures.
- **Standardized:** The certified data component is established as a data component preferred for use in new or updated applications. The “standardized” data component may be unique within the registry, or it may be the preferred data component among similar data components.
- **Retired:** A recorded, certified, or standardized data component that is no longer recommended for use in FAA applications.

These statuses are set by the Registrar.

4.2.9.3 Administrative Status. Each data element and other administered component in the FDR has an administrative status that provides information about where the component is in the standardization workflow process. Administrative statuses, which are also set by the Registrar, are:

- **Candidate:** The need for a standard data element or other administered component has been identified.
- **Interim:** A Working Group has been convened to gain consensus on the data standard. The Working Group has members representing each LOB and staff organization. A data steward is identified for the data standard. The Interim status ends when the case file has been submitted to the NAS CCB for processing.
- **Review:** A recommended data standard is under executive level review for approval. The recommended data standard is “frozen” pending approval authority action. No changes to the recommended data standard are permitted.
- **Final:** A recommended data standard has executive level approval for implementation in new application system development projects and in application system upgrades.
- **Unassigned:** A status has not been established.

4.3 FAA Metadata Repository

The [MDR](#), a key component of the FAA Data Management Policy, describes information systems and their data that are in use throughout the FAA. Each of these information systems enables the agency to deliver its essential services (e.g., air traffic services, airport management, aviation security, system safety, certification and regulation, and enterprise management). The MDR's interactive FAA Information Systems Inventory Report contains facts about each system, including owners, customers, hardware and software architecture, mission and function, data exchanged with other systems, and much more.

4.4 FAA Data Architecture

The [FAA Data Architecture V1.1](#) represents a high level logical architecture comprised of eight major subject area data models presented in entity-relationship diagram (ERD) notation. Currently being circulated for review and comment, the Architecture is a key tool in the FAA data management program, supporting data standardization, data requirements analysis and design in programs and projects, life-cycle management of data as an asset, and data quality initiatives. As it grows, it will become an

essential aid to data standardization efforts, helping to highlight shared or common data and key reference tables (value domains) and providing a basis for creating a proposed data standard.

4.5 Data Standardization Requirements Sources

Information necessary to support a specific data standardization requirement should be collected from appropriate sources. These information requirements may be collected from existing information systems' documents, data dictionaries, and data models; functional descriptions; and authoritative sources, such as policy and guidance. Information requirements may include a request to update (modify or retire) existing data standards.

The following are the prime sources of requirements:

- [Capital Investment Plan \(CIP\)](#) – Contains general descriptions of NAS projects.
- [Capability Architecture Tool Suite – Internet \(CATS-I\)](#) – [NAS-SR-1000](#) is being re-written and updated and will be incorporated into the NAS Architecture, which can be accessed via the CATS-I web site. The CATS-I has been developed as a systems engineering tool to help sustain the high level of NAS safety and air traffic services, define new NAS capabilities in partnership with the aviation system users to improve safety, security, and efficiency, and increase understanding of the complexity of the airspace system, its services, and capabilities.
- Standards and Orders – Various federal and industry standards and orders specify procedures, practices, and protocols for interfacing subsystems.
- External (Federal, National, and International) Data Standards – Reuse applicable external data standards before creating or modifying a NAS data standard. External Registrars or data stewards should be consulted to identify existing standards within their functional areas. The FDR should also be used to locate adopted external and NAS data standards.

Other sources of information include:

- [NAS-DD-1000](#) – NAS Level I Design Document – Contains a high level definition that identifies the allocation of functions to specific subsystems.
- [NAS-SS-1000](#) – NAS System Specification – Contains allocated functional/performance requirements and message tables for the information that will cross the interface.

4.6 Data Modeling Activities and Tools

Data modeling is a technique for formally describing data, its structure, and its relationships. Standards developers are encouraged to use or create a data model in order to see the context of the data they are trying to standardize, to help them understand the primary entities or objects that are involved, and to aid them in naming their proposed standards. The [FAA Data Modeling Process V1.1](#) document now being circulated for review and comment provides guidance on how to use data modeling effectively in relation to the FAA's Data Management Policy and its initiatives on data standards and data architecture. As stated in the document, modeling activities performed during application development should advance the data standardization and integration of data models through:

- Reuse of existing standard data elements and entity definitions within the FAA.
- Submission of standard data elements to the FDR.
- Mapping of legacy data elements available in the MDR to the standard data elements.
- Reuse of standardized data models, such as industry-wide data model patterns.

The data framework in Figure 6 depicts the interactions between the corporate FAA view, the LOB view, and the FDR, MDR, and LOB databases.

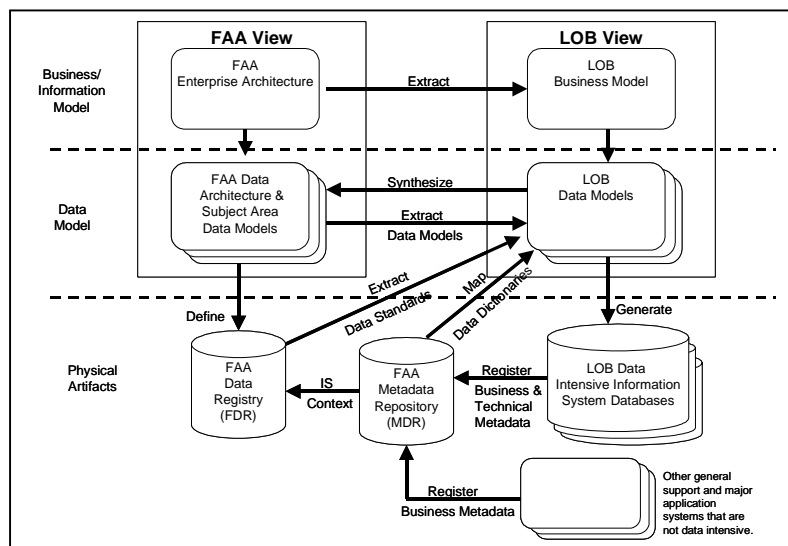


Figure 6: Data Framework

Methodologies and tools are described in greater detail in the referenced document and include recognized techniques like entity-relationship diagramming and object modeling. Whichever methodology is chosen, accepted notation standards like Integrated Computer-Aided Manufacturing Definition One Extended Data Modeling Technique (IDEF1X) or Unified Modeling Language (UML) that are employed in popular commercial off-the-shelf (COTS) tools should be used.

4.7 Groupware Collaboration Tool

The [Collaborative Data Integration Management System](#) (CDIMS) is a secure discussion tool that allows NIAC Working Group moderators to effectively conduct encrypted discussions, promote a negotiated settlement and call for votes on proposed items, and archive completed discussions. Participants can log onto the CDIMS Internet portal at their convenience and present their arguments on behalf of their organizations. No special software is required. CDIMS also provides an automated workflow capability in which discussions may be promoted to higher levels of reviewers for approval, disapproval, or action. Discussion status is tracked and statistics captured throughout the course of the discussion process, and Working Groups can use reports generated from the discussions as supporting materials for case files of proposed data standards.

5.0 DATA STANDARDS DEVELOPMENT PROCESS

5.1 Introduction

This chapter addresses the creation and coordination of new data standards, modification of existing data standards, retiring of existing data standards, and the preparation and submission of a data standards case file. Whereas Chapter 2 provided a summary discussion, it is the intent of this chapter to provide detailed discussion of the process. Figure 7 illustrates the process flow, and the subsequent paragraphs will “drill down” to the necessary level of discussion for each step.

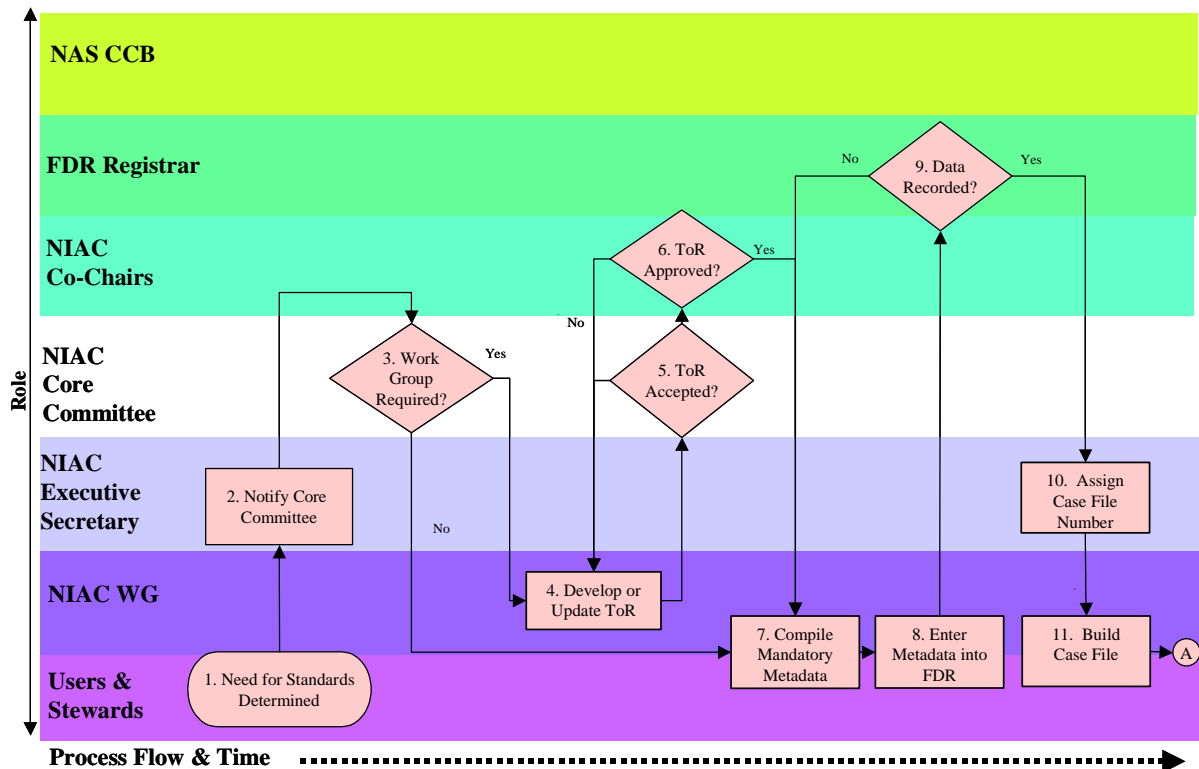


Figure 7: Standards Development Process.

The determination of a need for a data standard is a function of good systems engineering practice. Where interoperability risks are high or a cost-benefit assessment is positive, a standard should be a first consideration. In this business environment, a data element or concept typically has a life cycle process that should be considered independent of the data architecture or processing systems that are employed. Good information engineering practices encourage the use of open systems and application-independent data practices to reduce costs and allow for modernization.

5.2 Step 1 – Determining Need for Data Standard

The fundamental rules for determining a need for a data standard are:

- Is the data element in question considered a commonly or widely used item? *In other words, is this data element used across the NAS, between air route traffic control centers (ARTCC) or between facilities? Is it listed in several system data dictionaries?*
- Is it likely that the data element in question is exchanged between different or distributed systems? *An example would be the data in a flight position report: aircraft identification, departure airport, arrival airport, etc.*
- Is this data element a new requirement for a modernization program? *An example would be system specific “new data” like runway threshold latitude and longitude required for the Standard Terminal Automation Replacement System (STARS).*

Primary references that should be consulted to help answer these questions include the MDR, the FAA Data Architecture’s Corporate Data Model, and the NAS Architecture tool: CATS-I. If the response to any of these questions is “yes,” the individual (data steward or other user of the data element in question) who is initiating this standardization effort should document the findings for their potential utility as case file supporting material, and move to Step 2. In general, the collection and compilation of metadata under the direction of data stewards is encouraged. Though the data element in question may not be ultimately “standardized,” the effort to compile and assess the metadata is a valid activity for all data stewards.

The MDR is the main source for researching FAA’s legacy information systems since it collects a large variety of metadata about each system, including administrative and program management statistics, systems and programs with which it exchanges data, hardware platform and software tools it employs, and its data dictionary if available. The MDR provides a number of easily generated detailed reports, including listings of entities and their attributes, which may be used to support the need for establishing a data standard. The tool is available on the FAA Intranet; see Figure 8 for an illustration of the MDR home page.



Figure 8: FAA Metadata Repository

The next objective is to compare the *data element of interest* with metadata of data standards in the FDR. The FDR is easily accessed via the Internet; see Figure 9 for an illustration of the registry portal. The best approach for evaluating a new data element against the FDR contents is to compile the following metadata for the *data element of interest*:

- Definition or description of the data element
- Common name of the data element
- Range of values that the data element may assume
- Systems or databases that may employ the data element now or in future
- General classification of the data element



Figure 9: FAA Data Registry Portal

The initiator should then begin a *comparison search* of the registry by using the search and listing functions of the FDR. This task is generally a discovery effort in which the initiator is expected to assess the contents and determine the similarities of any new finds and the *data element of interest*. The following is the suggested priority of comparison and equation:

1. **Similar or same definition.** If the *data element of interest* and existing registry entries have about the same definition, which describes their purpose, further investigation is clearly warranted.
2. **Similar or close range of permissible values.** If the *data element of interest* and an existing registry entry have nearly the same value domain, further investigation is warranted.

3. **Similar or same name.** If the *data element of interest* and existing registry entries have about the same name, which suggests similar usage, further investigation is warranted.
4. **Similar or common system usage.** If the *data element of interest* and existing registry entries are used by the same or adjacent installations of the system, further investigation is warranted.
5. **Same classification.** If the *data element of interest* and existing registry entries possess the same classification, there is a basis for continuing the investigation.

In each situation, a continuation of the specific investigation implies that there is a basis for finding a similar, perhaps suitable standard or certified data element for use.

The objective in this analysis is to move toward a decision on a data standard. A refinement of the rules is as follows:

- If there is agreement with comparison item 1 and 2 for the *data element of interest*, then there is a basis for adopting the FDR standard data element for the system or database in lieu of the *data element of interest*.
- If there is agreement with comparison items 3 and 4 for the *data element of interest* with other data elements in the registry, then there is a basis for standardization of the data element of interest.
- If there is agreement with comparison items 4 and 5, then there is a basis for establishing a new standard based upon the *data element of interest* and those data elements found in the FDR.

These rules are offered as general guidance. It is incumbent on the initiator to assess the issues and work with the Registrar to develop a strategy for advancing those data elements under his/her purview toward standard data.

This information and assessment is summarily presented to the NIAC Executive Secretary for coordination and processing.

5.3 Steps 2 and 3 – Assessing Need for a Working Group

The initiator contacts the NIAC Executive Secretary, who notifies the NIAC Core Committee (Step 2) of the potential standardization effort. The Committee may use the following criteria to help determine whether or not a Working Group is required (Step 3):

- Is the *data element of interest* being processed (even singly) related to a larger set of data elements? Is sufficient information available to understand the relationship of the *data element of interest* to a broader formulation? If so, this would suggest wide use and interest, and a Working Group would be a prudent investment of resources. The Core Committee may recommend: 1) starting a new Working Group or 2) adding this item and initiator to an active (standing) Working Group.
- Is the *data element of interest* presented as a part of a large set? The presence of a large group of data elements for standardization suggests a broad impact and investigations will be extensive in

the course of building the case file. If so, this would suggest wide use and interest, and a Working Group would be a prudent investment of resources.

- Is the *data element of interest* presented as a new version of an existing standard? In this case, the initiator should be familiar with the various interested parties. In this situation, the Core Committee may advise the initiator to either 1) develop and coordinate a case file for the new data element version or 2) add the data element version to an existing working case file in process by another initiator or another Working Group. In any event, the timing must not materially affect the working case file, now acting as a host to the new data element.

5.4 Step 4 – Developing the Terms of Reference

The determination of need for a Working Group requires either the new development of a formal document called the ToR or that an existing ToR be updated to reflect the new responsibilities being placed on an existing Working Group.

ToR - The format and topical outline of the ToR is shown in [Appendix 4](#).

Working Group Chair - The ToR is normally developed by the individual designated the candidate Working Group Chair. This designation is a collaborative selection, normally done by the Core Committee and the manager of the initiator organization.

Working Group Membership - The composition of the Working Group is a function of those organizations and individuals who can be considered stakeholders in standardizing the *data element of interest*. Generally, this group of people will be systems engineers and database administrators representing the systems that use the data element or the class of data represented by the data element.

The ToR sets up a “partnering workshop” among those organizations represented. It is not expected to be a lengthy document= but simply a work statement that outlines the products, timelines, and commitments.

5.5 Steps 5 and 6 – Approving the Terms of Reference

The Executive Secretary is responsible for reviewing a prepared ToR for completeness. The format and outline shown in Appendix 4 is the basis for this review. The prepared ToR is then circulated among the Core Committee members. This circulation offers each Core Committee member the opportunity to assess and comment on the endeavor described in the ToR (Step 5). If the ToR is judged by all Committee members to be satisfactory, the Executive Secretary forwards it to the NIAC Co-Chairs for signature (Step 6). Otherwise, it may be returned to the author for coordination and resolution of any issues that surfaced during the review.

The NIAC Co-Chairs are responsible for making the final approval on a proposed ToR. It is expected that the prior reviews and assessments will have resolved any outstanding issues. The Co-Chair's signature formalizes the activities and provides notice to the larger community that a standardization effort is authorized. If collaborative efforts are necessary, the ToR is evidence that project should command the necessary resources to fulfill the need.

5.6 Step 7 – Compiling Mandatory Metadata

This step is necessary for gaining an understanding of the *data element of interest* and collecting the information for input into the FDR. As stated in Chapter 4, creation and registration of a potential standard data element requires that certain characteristics of the data element, called metadata, be recorded to clearly describe and define it. A list of this metadata is shown in [Appendix 1](#). The initiator should ensure that these characteristics are stored in the FDR. The discussion⁶ that follows is intended to describe the creation and capture of high quality, consistent metadata that meets the requirements of the Registrar.

5.6.1 Understanding the Data Element

The first thing to do is to gain an understanding of the data element. This means answering questions like:

- What kind of data will be stored in this data element?
- Is there a definition or description of the data values?
- Were permissible values or examples of the data provided?
- Will the data values be determined by an arithmetic or statistical procedure?
- What will the data values look like, e.g., are they names or descriptions of things, numbers to be calculated, strings of characters, and numbers that are identifiers?
- How is the data element used in existing applications?

Where documentation is inadequate to fully understand the data element, consult those who represent the source of the data element to get the necessary information.

When examining existing computer systems to find out how the data element is used, do not automatically assume that there will be a one-to-one correspondence between a field in a record and a data element. Data dictionaries may be available for mid- to large-scale systems, and they are a source of descriptive information. However, as systems evolve, fields can become used for multiple purposes under various conditions. When such a situation is detected, the field must be analyzed to understand the data item and to break down complex items into their constituent components. It may be desirable, if not necessary, to declare one or more data elements within a single data field. The reverse situation, where multiple fields correspond to or are necessary to define a single data element, is also possible, though less likely.

5.6.2 Collect Basic Data Element Information

Begin collecting information on the *data element of interest*. If the initiator prefers to begin compiling metadata off-line rather than enter it directly into the FDR, the Tab A data standard/developer compliance report shown in [Appendix 5](#) may be used as a worksheet to support the input of metadata into the FDR when the work has progressed to the point of registry input.

⁶ Some material in this section is adapted from: ISO/IEC PDTR 20943-1.3 *Information technology – Data management and interchange – Procedures for achieving metadata registry content consistency – Part 1: Data elements*, April 2001

While collecting and evaluating the metadata, consider the following:

- Is the data element described as an existing International, National, or FAA standard? *If so, there is good reason to accept the standard for use.*
- Does a data element exist in the FDR or other registries? *If so, research and assessments are already completed to assist in advancing a new data standard.*
- Does the data element have the potential for being reused? *If so, there are probably other interest parties or stakeholders who should participate in the standardization effort.*

The collection process product is a basis for developing the data standards, and the following steps expand and refine the data element information in preparation for registry operations.

5.6.2.1 Data Element Identification (Name)

The initiator should record the common term that identifies or names the *data element of interest*. At this point, it may be something cryptic like ACFT_POS_XYZ, but if this term is often used in FAA applications, then it should be used initially.

Modern naming conventions are useful in removing ambiguity and helpful in communicating use and meaning, especially when the identification process for a data element is initiated. The “old term” may be kept for accountability purposes, but modern conventions must be applied. A set of conventions for naming data elements in the FDR has been adopted; the conventions as well as a detailed description of how to create names can be found in [Appendix 2](#).

Developing the data element definition first helps to develop well-formed names by providing relevant words to use in the name. Briefly, formulation of data element names is accomplished by recognizing the component concepts of the data elements: object class term, property class term, and value domain term. An object class term is the name of a kind of “thing.” A property class term is the name of some information about the kind of “thing.” A value domain term is the name for an explicit representational form and interchange format. At least one formulated name must be assigned to a data element. The following data element name structure is shown with the proper case structure and separators between terms:

OBJECTClassTerm_PropertyClassTerm_value-domain-term

Note that the object class term is first, then the property class term, and finally the value domain term. The terms are separated by an underscore (“_”).

Examples: EMPLOYEEFullTime_Birthday_date-ANSI-X3.30
EMPLOYEEPartTime_LastName_text

Naming is important to the standardization effort. Careful formulation of the names (and other documenting meta-attributes) of data concepts promotes consistency of data element names and helps to prevent development of inappropriate data element names (i.e., different names for the same data element or the same name for different data elements).

If a data element might be adapted to meet a new requirement or if some attributes of an existing data element (e.g., value domain, data element concept, or conceptual domain) might be reused with the new data element, then an efficiency gain can be realized. Content research should include a search of conceptual domains, data element concepts, and value domains as well as data elements to identify attributes that might be relevant to the new data element.

5.6.2.2 Data Element Definition

The definition of the *data element of interest* is important and its composition should be the first step in documenting the data element. This definition may initially come from the data dictionary associated with the data element and application or system. The essential meaning of the data element must be captured in a data element definition. The definition should enable the reader to appreciate the purpose and use of the data element. The aforementioned data naming conventions should have helped the definition development. [Appendix 3](#) describes rules and guidelines for formulating good definitions.

5.6.2.3 Value Domain and Permissible Values

Operational data is frequently thought about in terms of the values that it may assume. Therefore, in compiling the metadata that describes the *data element of interest*, this key information must be noted. The value domain of a data element describes the values that the data element is allowed to have. [Appendix 1](#) contains detailed information about the kind of metadata captured for value domains, such as data type and interchange format.

The interchange format is used to indicate the position of punctuation, symbols, or other editing requirements for the data item value (e.g., YYYYMMDD is the interchange format for date). The value domain is an administered component, which means that administrative data, such as its name, definition, source, steward, any explanatory comments, etc., need to be entered. Domains can be enumerated (i.e., established through a list) or non-enumerated (e.g., specified through a formula, rule, procedure, or reference). Different metadata attributes are used depending upon whether the permissible values are enumerated or non-enumerated. Each enumerated permissible value is associated with a valid value meaning that provides meaning to the permissible value, as described in Chapter 4. Each enumerated permissible value is also entered in the registry with its begin date (i.e., the date when that permissible value became valid for a value meaning in that registry). End dates will also be entered when the permissible value for a value meaning becomes invalid. Value domains for non-enumerated domains must include a *description* of the values that are valid for those domains.

5.6.2.4 Steward Organization

At some point in the standards development, organizational responsibility in the form of a data steward must be declared. It is useful to gather and record information of organizational interest or responsibility for the *data element of interest*.

5.6.2.5 References

References are important to understanding the requirements for the *data element of interest*. Further, building a case file and promoting a new data standard is based upon an understood need that should be available from the references. It is important qualifying information.

5.6.2.6 Usage

Like references, understanding the applications or systems that use the *data element of interest* is important. These applications and systems must be documented as they will lead to other interested parties with unique requirements that must be understood in order to promote an application-independent data standard. It is important to understand the specific contexts in which the data is used now or is planned to be used in future.

5.7 Step 8 – Entering Metadata in the FAA Data Registry

The initiator or person(s) who will be entering the metadata into the FDR should access the FDR Portal and apply for a user account with the Registrar. Once the account is established, the initiator can conduct transactions with the registry tool. Explicit directions for entering metadata into FDR can be found in the FDR on-line help and [FDR Users Guide](#). FDR training is also offered periodically by the Office of Information Services.

5.8 Step 9 – Updating the Registration Status

As explained in the previous chapter, all potential standards entered in the FDR have an Administrative Status, which explains where the candidate element is in the standardization workflow process, and a Registration Status, which reflects the level of quality and utility of its metadata in the FDR. At various points in the process and always in coordination with the initiator, the Registrar assigns these statuses appropriately. Some of the metadata items in [Appendix 1](#) are denoted as “mandatory,” and the initiator should know that all of the mandatory fields must be completed in the FDR for the Registrar to qualify the Registration Status of the *data element of interest* as “recorded.” (The default or lowest Registration Status is “incomplete.”) As the candidate element passes through the succession of quality reviews by NIAC and the NAS CCB, it will achieve “certified” status and ultimately become “standardized.” The “standardized” data element is the preferred data element to be used for data sharing to ensure consistent representation and understanding of the data being communicated.

5.9 Steps 10 and 11 – Preparing the Case File

If a Working Group has been tasked with initiating the proposed data standard effort, the Working Group Chair will collaboratively discuss and resolve technical and data stewardship assignment issues within the Working Group. When these issues are resolved, the Working Group Chair or individual initiator (data steward or other user) then prepares a case file package containing the proposed standard(s) with supporting materials deemed relevant by the initiator. The initiator requests a *case file number* (Step 10) from the NIAC Executive Secretary and coordinates with the Registrar to promote the Administrative Status of the proposed data standard(s) from “candidate” to “interim,” which means that it is ready for NIAC review.

When the proposed data standard(s) have been documented (Step 11) and registered as described above, the initiator or Working Group Chair is ready to proceed to the approval phase. This phase is described in the next chapter.

6.0 DATA STANDARDS APPROVAL PROCESS

6.1 Introduction

This chapter addresses the technical and cross-functional review and approval of data standards using the NCP process. This process is illustrated in Figure 10.

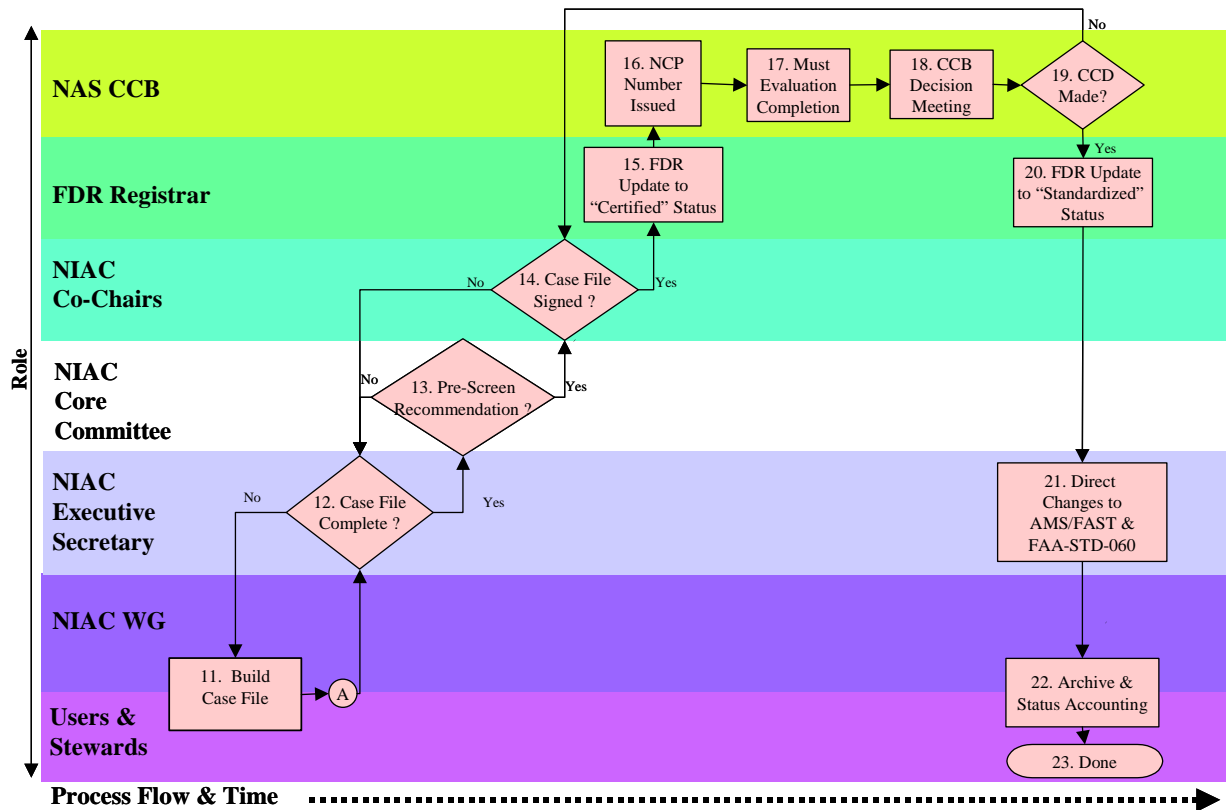


Figure 10: Standards Approval Process

6.2 Step 12 – Reviewing the Case File for Completeness

As described in the previous chapter, the Working Group Chair or individual initiator (data steward or other user) prepares a [case file package](#) containing the proposed standard(s) with supporting materials deemed relevant by the initiator. The initiator then forwards the case file package to the NIAC Executive Secretary who reviews this package for completeness and works with the initiator to obtain any missing information. Once it has been determined that the case file package is complete, notification is made to the initiator (also known as the case file originator for NAS CCB purposes), and the case file package is distributed to the NIAC Core Committee for pre-screening review.

6.3 Steps 13 through 15 – Pre-Screening the Case File

The results of the NIAC Core Committee’s technical review (Step 13) will be provided to the case file originator. Any comments that have been produced as a result of this review must be addressed and

resolved by the case file originator. The consolidated result of the pre-screening review will be submitted to the NIAC Co-Chairs (Step 14) for final signature and recommendation to NAS CCB. Once the case file has been signed by the NIAC Co-Chairs, the Administrative and Registration Statuses of the candidate data elements in the FDR are updated to “review” and “certified” respectively (Step 15), and the case file is submitted to the Central Configuration Management Control Desk for processing.

The pre-screening review ensures that the candidate data standards are represented uniformly with a NAS perspective. The pre-screening review accomplishes the following:

- Ensures that the candidate entities and data elements and required metadata are clear, meaningful, and consistent with cross-functional area missions, objectives, and information requirements.
- Validates that the candidate entities and data elements are represented uniformly with a NAS perspective so that they can be interpreted consistently.
- Validates that the entity relationships accurately reflect business rules that are implemented uniformly with a NAS perspective.
- Provides the functional community with the opportunity to review the proposals and determine the impact of candidate standards on current implementations.
- Ensures data requirements are represented using as general terminology as possible.

6.4 Steps 16 through 19 – Evaluating the NAS Change Proposal

The Central Configuration Management Control Desk receives the completed signed case file package from the NIAC Executive Secretary. Once it has determined that the case file package meets the NAS Configuration Management criteria, the case file is assigned a NCP number (Step 16). The NCP is forwarded to the NAS CCB Configuration Management Lead and prepared for distribution to NAS CCB permanent members and other SMEs for a formal review (Step 17). Comments that are produced as a result of this review are coordinated through the NIAC Executive Secretary with the case file originator for resolution. **All comments must be addressed and resolved prior to CCB decision.** The case file originator will formally present the NCP at both the NAS CCB pre-brief meeting and the NAS CCB formal meeting (Step 18). Upon approval of the NCP, a CCD is issued (Step 19).

6.5 Steps 20 through 22 – Implementing the Configuration Control Decision

A signed CCD records the decision of the NAS CCB and outlines the implementation actions, such as the following:

- Update the Administrative and Registration Statuses of the newly approved data elements in the FDR to “final” and “standardized” respectively (Step 20).
- Publish the new data standard and provide hard copies to the [Document Control Center](#), which includes updating the list of approved individual data standards maintained in Appendix C of FAA-STD-060 (Step 21).

- Maintain the FDR, including retiring the previous versions of the new individual standards, if any, and updating the FAA Data Architecture's Corporate Data Model, as appropriate (Step 22).

6.6 Modification to Existing Data Standards

Modifications to approved NAS data standards will be processed in the same manner as for new data standards. These modifications will be entered in the FDR as developmental versions of the existing approved NAS data standard. If the modification is approved, the superseded NAS data standard will be retired, and the Registrar will update the FDR appropriately.

6.7 Periodic Review of Data Standards

6.7.1 The Registrar will run periodic FDR status reports to assist the NIAC Co-Chairs in determining appropriate actions.

6.7.2 On a periodic basis, the Registrar will review all candidate data standards that have not been approved and have remained static in the FDR for longer than 60 days. The Registrar will inform the NIAC Executive Secretary and the Co-Chairs of the review results.

6.7.3 Developmental and candidate data standards that have not been registered and have remained static for longer than one year with no revisions or modifications will be removed from the FDR and their steward or initiator notified.

APPENDIX 1. METADATA REQUIREMENTS

The metadata items needed for documenting NAS data standards are listed in the following table. An “X” in column two means that this metadata must be supplied in order to register a data element or other administered component in the FAA Data Registry. Metadata entries for a typical data element named AIRPORT_Location_identifier-ICAO are shown in column four for illustrative purposes. The metadata items included in the table are those of primary interest to the user; for more information on other registry-specific metadata, see the FDR.

Metadata		Definition	Example
Descriptive Name (a.k.a. Long Name)		A single or multiword designation assigned to a data element or other administered component constructed in accordance with the FDR naming convention. This name is unique within a single registry context.	AIRPORT_Location_identifier-ICAO
Abbreviated Name (a.k.a. Name)	X	A shortened form of the Descriptive Name of the data element or other administered component.	arprt_lctn_idntfr-ICAO
Alternate Name(s)		Single or multi-word designation for a data element or other administered component that differs from the Descriptive Name but represents the same data element or administered component.	AERODROME_Location_identifier-ICAO
Alternate Name Language		The identity of a language in which an alternate name is expressed. (Note: this includes programming languages.)	English
Definition	X	A natural language textual statement that expresses the essential nature of the data element or other administered component and permits its differentiation from all others.	The landing facility location identifier that was created in accordance with the International Civil Aviation Organization (ICAO) rules, assigned to the airport, and must be employed in filing of international flight plans conducted under the ICAO rules.
Context	X	The domain of discourse within which a data element or other administered component Name is valid.	FAA

Metadata		Definition	Example
Classification Scheme		A reference to a scheme for the arrangement or division of objects into groups based on characteristics that the objects have in common, e.g., origin, composition, structure, application, and function. Examples of schemes include taxonomies, thesauri, etc.	NAS Data Classification Scheme
Classification Scheme Item		A component of content in a classification scheme; this may be a node in a taxonomy or ontology, a term in a thesaurus, etc.	5.1 – Landing Facilities
Effective Begin Date		The date that a data standard is approved for use.	01/18/2002
Effective End Date		The date that a data standard is no longer approved for use, i.e., retired.	01/18/2007
Administrative Status (a. k. a. Workflow Status) (Entered by Registrar)	X	<p>The administrative status of a data element or other administered component.</p> <p>Valid values:</p> <p>Candidate: The need for a standard data element or other administered component has been identified.</p> <p>Interim: A Working Group has been convened to gain consensus on the data standard. The Working Group has members representing each LOB and staff organization. A data steward is identified for the data standard. The Interim Status ends when the case file has been submitted to the NAS CCB for processing.</p> <p>Review: A recommended data standard is under executive level review for approval. The recommended data standard is “frozen” pending approval authority action. No changes to the recommended data standard are permitted.</p> <p>Final: A recommended data standard has executive level approval for implementation in new application system development projects and in application system upgrades.</p> <p>Unassigned: Workflow Status has not been established.</p>	Final
Data Identifier	X	A language independent identifier of a data element or other administered component that, taken together with its Version, uniquely identifies it in the FDR.	1694
Version	X	An identification of the latest or previous update in a series of evolving specifications for a data element or other administered component within the FDR.	1
Data Concept (a. k. a. Data Element Concept)	X	A concept that can be presented in the form of a data element described independently of any particular representation.	AIRPORT_Location

Metadata		Definition	Example
Object Class		A set of ideas, abstractions, or things in the real world that can be identified with explicit boundaries and meaning and whose properties and behavior follow the same rules.	AIRPORT
Object Class Qualifier		A word or words that subtypes an object class.	Regional
Property		A characteristic common to all members of an object class.	Address
Property Qualifier		A word or words that subtypes a property.	Street
High Value		The largest permissible value for data elements or value domains with representational forms of quantity.	N/A
Low Value		The smallest permissible value for data elements or value domains with representational forms of quantity.	N/A
Unit of Measure		A single or multiple word designation assigned to a measurement framework for data elements or value domains with representational forms of quantity, e.g., watt, mile, miles-per-hour, ton, ampere.	N/A
Unit of Measure Definition		A statement that expresses the essential nature of a measurement system associated with a data element or value domain and permits its differentiation from all other units of measure, e.g., ampere = “measure of electric current.” See FDR for additional information.	N/A
Data Type	X	A single or multiple word designation assigned to a data type associated with a data element’s value domain. Legal values are binary, bitmap, Boolean, date, datetime, decimal, integer, real, recurringinstant, string, time, timeduration, unassigned, Universal Resource Indicator (URI). See FDR for additional information.	String
Data Type Definition		A statement that expresses the essential nature of a data type associated with a data element’s value domain and permits its differentiation from all other data types.	A finite sequence of ASCII characters
Maximum Length	X	The maximum number of storage units (of a corresponding data type) needed to represent a data element or value domain.	4
Minimum Length		The minimum number of storage units (of a corresponding data type) needed to represent a data element or value domain.	4
Interchange Format (a.k.a. Format)		A single or multiple word designation assigned to a form of interchange for a data element that permits its differentiation from all other interchange formats, e.g., YYYYMMDD for calendar date, where YYYY represents a year, MM represents an ordinal numbered month in a year, and DD represents an ordinal numbered day of a month.	aaaa, where “a” represents a character A-Z or 0-9

Metadata		Definition	Example
Permissible Values		The set of representations of allowable instances of an enumerated value domain of a data element represented according to the interchange format, data type, and maximum length constraints. The set of representations of permissible instances is associated with one set of value meanings . The set can be specified by name (e.g., Postal U.S. State Codes), reference to a source, enumeration of the instances' representations (e.g., AL, AK, etc.), or rules for generating the instances.	ICAO 7910 Airport Code List of codes for the representation of ground facilities where aircraft land and take off; PANC PHNL Etc.
Conceptual Domain	X	A set of value meanings of a data concept, expressed without representation	Identification
Conceptual Domain Definition		A natural language textual statement that expresses the essential nature of the conceptual domain and permits its differentiation from all other conceptual domains.	The notion of marking something for reference purposes, e.g., identifier.
Value Meaning		A statement that expresses the essential nature of a set of permissible values without a specific representation and permits its differentiation from all other sets. The set can be specified by name (e.g., the states of the United States), or enumeration of the meanings of each permissible value (e.g., the state of Alabama, the state of Alaska, etc.).	Airports known as Anchorage International Airport, Honolulu International Airport, etc.
Value Domain	X	A named set of permissible values.	Identifier
Value Domain Definition		A description of a value domain that does not have an explicit set of values, i.e., is not an enumerated value domain.	An alphanumeric code that uniquely identifies an entity within a specified context.
Character Set		A set of graphic symbols (e.g., hieroglyphics or letters) used in writing or printing, e.g., US 7-bit ASCII, Unicode.	US 7 ASCII
Example		A representative sample of a typical instance of the data element or other administered component, in quotes, if it can be represented as a printable character string.	"KDCA," "PANC"
Document Name		The name of a document pertinent to a data element or other administered component.	FAA Order 7350.7F Location Identifiers
Document Type		The type of a document pertinent to a data element or other administered component.	FAA Order
Document Language		The kind of natural language used in a document.	English
Document URL		The Internet Uniform Resource Locator (URL) where the document may be found.	http://www.faa.gov/atpubs/index.htm
Document Text		An abstract or summary of the document or the actual text of a short document.	List of landing facility location identifiers created in accordance with ICAO rules

Metadata	Definition	Example
Steward Organization	The organization or unit within an organization that is responsible for the contents of the meta attributes documenting a data element or other administered component in the FDR.	Aeronautical Information Division, ATA-100
Submitter Organization	The organization or unit within an organization that has submitted a data element or other administered component for addition, change, or cancellation/withdrawal in the FDR.	Office of Information Services/CIO, AIO-300
Case File Number	Identifier assigned by the NAS CCB.	SD110-NAS-001
Comments	Additional explanatory information.	Continental United States airport codes begin with 'K'. Alaska and Hawaii airport codes begin with 'P'.
Registration Status (Entered by Registrar)	<p>The registration status of a data element or other administered component. Values are:</p> <p>Incomplete: The registered data component does not contain all Mandatory Attribute values.</p> <p>Recorded: The registered data component contains all Mandatory Attribute values, but the contents may not meet the quality requirements specified in ISO/IEC 11179 and FDR procedures.</p> <p>Certified: The recorded data component has met the quality requirements specified in ISO/IEC 11179 and FDR procedures.</p> <p>Standardized: The certified data component is established as a data component preferred for use in new or updated applications. The “standardized” data component may be unique within the registry or it may be the preferred data component among similar data components.</p> <p>Retired: A recorded, certified, or standardized data component that is no longer recommended for use in FAA applications.</p>	Standardized

Metadata	Definition	Example
<p>Case File Status</p> <p>(Entered by Registrar)</p>	<p>The status of the case file that supports establishment of one or more data standards. Values are:</p> <p>Proposed Change: This case file is being developed for one or several data elements or other administered components to be standardized. Completed case file will be forwarded to NIAC Core Committee for review.</p> <p>Prescreening: NIAC Core Committee is reviewing this case file for recommendation to the NIAC Co-Chairs. NIAC Co-Chairs will sign case file and forward to Central Control Desk.</p> <p>Must Evaluation: Central Control Desk has assigned a NCP number to this case file and has forwarded the NCP to NAS CCB Configuration Management for processing. NCP has been distributed for review to all permanent members of the CCB.</p> <p>Pending Decision: NCP review has been completed and all comments resolved, and a draft CCD is being prepared for NAS CCB Co-Chair signature.</p> <p>Implementation: CCD has been signed by NAS CCB, and implementation actions specified in the CCD are being carried out.</p> <p>Closed: CCD actions have been completed.</p> <p>Withdrawn: Originator has withdrawn this case file. An originator can withdraw the case file/NCP at any time prior to the CCD being signed.</p>	<p>Closed</p>

APPENDIX 2.

NAMING AND ABBREVIATION CONVENTIONS FOR DATA CONCEPTS

1.0 Introduction

Conventions for assigning descriptive names to data elements, their component parts, their abbreviations, and use of acronyms are described in this document. These conventions are consistent with principles of the ISO/IEC 11179 standard, *Specification and Standardization of Data Elements*, Part 5, *Naming and Identification Principles for Data Elements*.

The descriptive name is a name that reflects the business meaning of the data element or a component of a data element. The descriptive name is a formalized synopsis of the data element's definition and representation. Abbreviated names are used primarily as physical names (also referred to as internal, access, or symbolic names in the database environments). Acronyms are used as shorthand references to names or phrases commonly understood in the FAA.

The descriptive name should be formulated after the definition development for the data element or data element component in order to determine appropriate words for use in the descriptive name.

In addition to data elements, these conventions also apply to components of a data element (data element concept, object class, property class, and value domain).

2.0 Purpose

The purpose of this document is to provide specific guidance to follow when constructing data element names and their component parts for data elements or other data concepts that are to be entered into the FAA Data Registry. Guidelines are given for both logical and physical names.

Using these conventions will provide consistent names of data contained in the FAA Data Registry that comply with naming principles specified in ISO/IEC 11179, Part 5. Such names are readily recognizable nationally and internationally in any community with an ISO/IEC 11179 compliant data registry.

Other data naming conventions are being applied within the FAA for specific purposes, such as those specified in the Air Traffic Services (ATS) National Data Center Metadata Management and the National Aviation Safety Data Analysis Center Lexicon of Naming Standards documents. Names constructed under such conventions become alternate names for data that is entered into the FDR.

3.0 Scope

These conventions apply only to data elements and their components that are to be entered into the FDR. These conventions can be applied in naming data in other data constructs (such as in the FAA Metadata Registry, data models, or specific applications) where it is useful to do so.

4.0 Structure Of Data Element Names

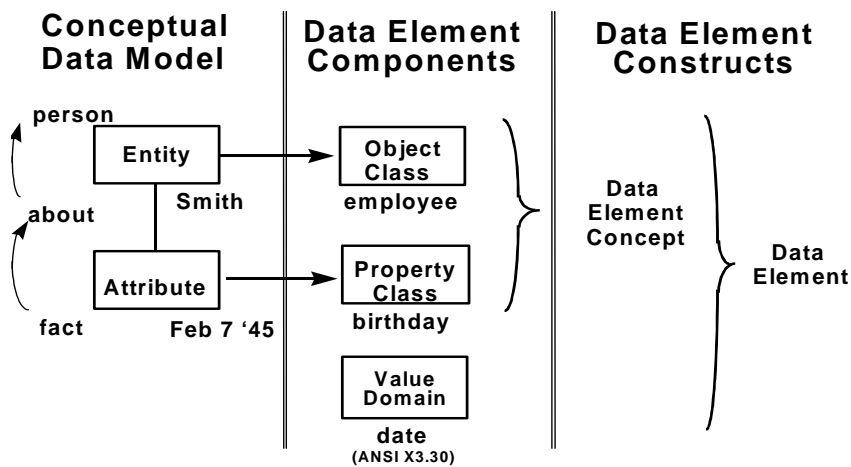
A data element is a formalized **representation of information** (fact, proposition, or observation) **about something** (person, place, process, thing, concept, association, or event). A data element representation may be character-based, graphic, imagery, sonic, or other complex form.

A data element name is a composite of three components: object class term, property class term, and a value domain term. The center column of Figure 1 illustrates these three components. An object class (e.g., person) is an abstraction of a real world entity (e.g., the person named Smith). A property class (e.g., a particular kind of day, called birthday) is an abstraction of a type of information about the real world entity (the birth event of this particular Smith). A value domain is an abstraction of the physical form of that information (in this case: date, in ANSI X3.30 representational form). Referring to Figure A2-1, the data element illustrated is “employee birthday date.” An instance of this data element is “19450207,” representing the 7 February 1945 birthday of some person named “Smith,” in accordance with the ANSI X3.30 standard.

A data element concept refers to the essential meaning of the data element without any implementing value domain representations, in this case “employee birthday.” Such a data element concept may be combined with appropriate value domain terms to specify different data elements, e.g., employee birthday may be combined with “code” to form the data element “employee birthday code,” where the explicit value domain for code is defined as:

employee birthday code	birthday range
“1”	before 1900
“2”	1900-1949
“3”	1950-2000
“4”	after 2000

Use of data element concepts promotes standardization of data elements.



Adapted from ISO 11179: Specification & Standardization of Data Elements, Part 1

Figure A2-1: Data Element Structure

5.0 Logical Data Element Naming Guidelines

Formulation of data element names is best accomplished by first formulating the names of the components of the data elements: object class term, property class term, and value domain term. Each of these terms consists of a primary word with, optionally, one or modifier words. An object class term is the name of a kind of “thing.” A property class term is the name of some information about the kind of “thing.” A property is sometimes referred to as “attribute,” though in common Computer-Aided System Engineering (CASE) tool usage an attribute typically combines the property class and value domain. A value domain term is the name for an explicit representational form and format. Careful formulation of the names (and other documenting meta-attributes) of data elements and their components promotes consistency of data element names and helps prevent development of inappropriate data element names (i.e., different names for the same data element or the same name for different data elements).

A number of general guidelines apply to all descriptive names. Spaces, prepositions, and conjunctions are not allowed in descriptive names. Except for periods (“.”), underscores (“_”), and hyphens (“-”), punctuation marks and other symbols are not allowed in descriptive names. Words used in the descriptive name are nouns. Abbreviations and acronyms are not recommended for use in the descriptive name unless required to keep the name within maximum length parameters or if they are commonly used in the domain of discourse. When abbreviations or acronyms are used in the descriptive name, they must be spelled out in the definition of the data element or data element component.

5.1. Object Class Terms

An object class term indicates the type of “thing” relevant to the data element. An object class is a person, place, process, thing, concept, association, or event about which information must be recorded.

The structure of the object class term of a data element name is

OBJECTClassTerm

The object class term is a concatenation of one or more words that communicates the essence of the object class. The first word in the term (the object class name) is in all capital letters with subsequent qualifier words in initial capital letters, if needed. The maximum length of an object class term is 60 characters. Examples: EMPLOYEEFullTime, EMPLOYEEPartTime.

5.2 Property Class Terms

A property class term reflects the relevant information in the data element, i.e., the “information of interest” about the “thing”. The information of interest may be a fact, proposition, or observation about the object class.

The structure of the property class term of a data element name is

PropertyClassTerm

The property class term is a concatenation of one or more words that communicates the essence of the property class. The words in the term are in initial capital letters with no spaces or special characters.

The first word is the property class name, with subsequent qualifier words if needed. The maximum length of a property class term is 60 characters. Examples: Birthday, MarriageDay.

5.3 Value Domain Terms

A value domain term indicates, unambiguously, the way in which the values of a data element are represented.

The structure of the value domain term of a data element name is

value-domain-term

The value domain term is a concatenation of one or more words that communicates the essence of the value domain. Recommended value domain terms are provided in Attachment 1. The first word is the basic value domain name (also referred to as representation class name). Subsequent qualifier words, if needed (such as unit of measure for quantity-oriented value domains), will uniquely characterize the value domain and are separated by a hyphen (“-”). Acronyms are permitted after the first word to make the value domain explicit, provided that such acronyms are in common usage. The maximum length of the value domain term is 30 characters. Examples: date-ANSI-X3.30, text-UTF8.

5.4 Data Element Name Format

Data element names consist of an object class term, a property class term, and a value domain term.

The structure of a data element name is

OBJECTClassTerm_PropertyClassTerm_value-domain-term

with the object class term first, then the property class term, followed by the value domain term. The terms are separated by an underscore (“_”). Examples: EMPLOYEEFullTime_Birthday_date-ANSI-X3.30, EMPLOYEEPartTime_LastName_text-UTF8.

5.5 Data Element Concept Name Format

Data element concept names consist of an object class term and a property class term.

The structure of a data element concept name is

OBJECTClassTerm_PropertyClassTerm

with the object class term first, followed by the property class term. The object class term and property class terms are separated by an underscore (“_”). A data element concept can be used with alternative value domain terms to develop different data elements, e.g., combined with explicit value domains such

as “text” or “code.” Examples of a data element concept term: EMPLOYEEFullTime_Birthday, EMPLOYEEPartTime_LastName.

6.0 Physical Data Element Naming Guidelines

Abbreviations of and use of acronyms in descriptive names are used to reduce the length of the descriptive name. Such reductions in length are often necessary to formulate a physical name for use in database or application program development (or, less often, to obtain a logical name that conforms to the maximum length constraints specified above) or to improve readability (e.g., use of the acronym RADAR in place of Radio Detecting and Ranging). This section describes a recommended way to abbreviate descriptive names for use as physical names.

The maximum length of physical names is 30 characters (inclusive of separators) for all components of the abbreviated name (i.e., object class term, property class term, and value domain term).

Where maximum length of physical or descriptive names must be reduced further to accommodate specific software tool environments, e.g., CASE or Data Base Management Systems, supplemental guidelines for abbreviation rules apply.

6.1 Abbreviation and Acronym Guidelines

All abbreviations are written in lower case letters, except for acronyms—if used. Hyphens (“-”) are removed from the value domain term in the abbreviation process. Underscore (“_”) separators between name component terms are not removed. Abbreviation of each word always begins with the first letter of the word, whether a vowel or consonant. Words are abbreviated by first removing all special characters (except those specified below). Next, all remaining vowels (except the last vowel, if it is not silent) are removed, then any double consonants are removed. Examples: “commission” becomes “cmsn,” “entity” becomes “enty,” “commerce” becomes “cmrc.”

In the event that these guidelines result in an abbreviated name that is greater than 30 characters (or that exceeds the maximum length permitted by software tool environments in use), supplemental guidelines are applied. In such cases, the trailing letter of the word abbreviation(s) with the largest number of characters is (are) removed until the data name abbreviation is not more than 30 characters long (or within the maximum number of characters permitted by the software tool environment). However, the value domain term abbreviation is never further abbreviated from the abbreviations given in Attachment 1.

The resulting abbreviated descriptive name shall be unique, i.e., an abbreviation must refer to only one data element or data element component. Thus, if using the abbreviation guidelines results in an abbreviation that is the same as a previously existing abbreviation for a different data element or data element component, vowels are re-introduced from left to right in the abbreviation until the abbreviation is unique, with removal of consonants (if necessary) accomplished to compensate for the resulting longer name.

Abbreviations may not be words. Therefore, if the preceding guidance results in an abbreviation that is a word, vowels are re-introduced from left to right until the abbreviation is not a word, with removal of consonants (if necessary) accomplished to compensate for the resulting longer name.

Acronyms may be used in place of word abbreviations in a physical name. Acronyms are formed by using the first letter of each word in a name or phrase in upper case characters. When an acronym is part of the name or phrase, the first letter of the acronym is used. Acronyms do not need to be unique. Letters representing prepositions or articles are not typically included in acronyms, unless the acronym is already in common usage. Examples: FAA, for Federal Aviation Administration; DOD, for Department of Defense; NAS, for National Airspace System; NIAC, for NAS Information Architecture Committee; and FDR, for FAA Data Registry.

6.2 Data Element Name Abbreviation

The structure of a data element abbreviated name is

objclstrm_prprtyclstrm_vludmnt

where the abbreviated words of the object class term, property class term, and value domain terms are separated by an underscore (“_”). Examples: emplefltm_lstnm_txt-UTF8, emleprttm_brthdy_dt.

6.3 Documentation of Abbreviations and Acronyms

The FAA Data Registrar will maintain an index of acronyms and word abbreviations, which will list all acronyms and abbreviations used in the FDR environment. To facilitate reuse of existing abbreviations, the Registrar will maintain the index alphabetically in both word name and acronym or abbreviation sequence. No acronyms or abbreviations will be constructed before checking the index of abbreviations for an existing previously defined abbreviation or acronym.

If abbreviated name length constraints require development of multiple abbreviations for the same data element or data element component, each abbreviation will be separately listed against its word name.

Attachment 1: Value Domain Core Terms

Recommended value domain core terms (and their abbreviations) are listed below. A representation class term abbreviation may not be further abbreviated than the abbreviations shown below.

See the value domain terms recorded in the FDR for the most current list.

amount-dollar (amnt-dlr): A numeric quantification of a monetary value expressed in monetary units of U.S. dollars and cents in the form “\$\$\$\$.¢¢,” where “\$\$\$\$” represents dollars to whatever number of significant digits is required and “¢¢” represents the number of cents. For non-monetary numeric values, use the “quantity” value domain term.

code (cd): An alphanumeric character or symbol (or a string of characters or symbols) that represents a specific meaning, e.g., “LAX” for “Los Angeles International Airport” and “ORD” for “Chicago O'Hare International Airport.”

The explicit representations for certain codes are as follows:

code-X3.38 (cd-X3.38); States of the United States: ANSI X3.38, *Codes—Identification of States, the District of Columbia, and the Outlying and Associated Areas of the United States*. Note that these codes are interchanged (and stored, where possible) in the two alpha character format option of the standard, regardless of their display/report formats.

code-ISO3166 (cd-ISO3166); Countries of the World: ISO/IEC 3166, *Codes for the Representation of Names of Countries*. Note: Country code is always stored and interchanged in the two alpha code format option, regardless of any display/report formats.

code-ISO5218 (cd5218); Human Sex: ISO/IEC 5218, *Representation of the Human Sexes*. Note: only three of the four codes for representation of human sexes shall be used: “0” for Unknown, “1” for Male, and “2” for Female.

date (dt): An identification of a particular Gregorian calendar day expressed by its calendar year, month, and ordinal numbered day within the month in the form YYYYMMDD.

The value domain term date, without modifiers, shall refer to ANSI X3.30, *Representation of Date for Information Interchange*, i.e., YYYYMMDD, where YYYY represents a calendar year in the Gregorian calendar, MM represents a month within such a year, and DD represents a day in such a month. This value domain specification is the same as that specified in ISO/IEC 8601-2000, *Data elements and interchange formats—Information interchange—Representation of dates and times*, Clause 5.2, Dates, Subclause 5.2.1.1, Complete Representation—Basic format.

date-time-UTC: The data group presents the current date and time in accordance with the date and time scale maintained by the Bureau International des Poids et Mesures (International Bureau of Weights and Measures) and the International Earth Rotation Service (IERS), which forms the basis of a coordinated dissemination of standard frequencies and time signals and is denoted as Universal Coordinated Time (UTC), in the form YYYYMMDDhhmmss.ssssZ, with seconds optionally to ten-thousandths.

degrees (dgrs): An angular measure.

elevation-AGL (elvtn-AGL): The height or vertical distance of a level, a point or an object considered as a point, on, above, or below the surface of the earth, measured in feet, from the earth's surface.

elevation-MSL (elvtn-MSL): The vertical distance of a level, a point or object considered as a point, on, above, or below the surface of the earth, measured in feet, from the earth's mean sea level datum.

grid (grd): A finite collection of (usually uniformly spaced) points.

identifier (idntfr): An alphanumeric code that uniquely identifies an entity within a specified context.

indicator (indctr): A special binary code or "flag," such as Y/N, on/off, T/F.

image (img): A graphical or pictorial item, e.g., a map, diagram or other graphic, picture, video, movie, or icon. The explicit value domain for each type of image shall be specified with the appropriate suffix, e.g., image-JPEG, image-GIF, etc.

latitude (ltd): The angular distance of a point from the earth's equator, north or south, expressed in degrees, minutes, and seconds optionally to ten-thousandths in the form DDDMMSS.ssss(N/S), e.g., "753440.3428N."

location (lctn): A geographical point on, under, or above the surface of the earth. The standard value domain for location is given by:

ISO/IEC 6709, *Standard Representation of Latitude, Longitude, and Altitude for Geographic Points*.

Note: latitude and longitude are always interchanged (and should be stored) in the degrees, minutes, seconds, and decimal seconds, with altitude in meters and decimal meters option of ISO 6709 regardless of their display/report formats; i.e., (+or -)DDMMSS.ss(+or -)DDMMSS.ss(+or -)999.999, in the sequence of latitude/longitude/altitude, with no spaces, where DD or DDD is degrees, MM is minutes, SS is seconds, and ss is decimal seconds of either latitude or longitude (to whatever number of significant digits is required); and 999.999 is height above sea level in meters and decimal meters. (Note: The parentheses and "or" are not part of the format, but they are used merely to indicate a choice of either positive or negative latitude, longitude, and altitude.) While only three digits are shown in the format for altitude, the actual number of digits for an instance of altitude will be the number necessary to represent altitude to the number of significant digits required. Representation of decimal components of latitude and longitude is optional, and altitude is optional.

longitude (lngtd): The angular distance between a given point and the zero meridian passing through Greenwich, England, east or west, expressed in degrees, minutes, and seconds optionally to ten thousandths, in the form DDDMMSS.ssss(E/W), e.g., "1354350.9809W."

number (nmbr): A non-computational numeric or alphanumeric string used to designate an item, e.g., a serial number, telephone number, street number, apartment number, or social security number. The explicit value domain for the representation class "number" is the set of all character-based [ANSI236] numbers.

percent (prcnt): A ratio of two quantities expressed in numeric format as a decimal number multiplied by 100. The explicit value domain for the representation class “percent” is “999.999,” with however many significant digits are necessary for each of the whole number and decimal fraction portions of the number. Such percents are positive or negative real numbers.

quantity (qnty): A non-monetary numeric value subject to computational manipulations. The explicit value representation of this value domain is the set of all real or imaginary numbers.

rate (rt): A numeric unit of measure expressing the ratio of a quantity to another quantity, e.g., “miles per hour,” “gallons per hour,” “dollars per day.” The explicit value domain for “rate” is positive or negative integers, with the type of rate indicated by a suffix, e.g., rate-miles-per-hour (rt-ml-pr-hr).

sound (snd): An audio sequence with an explicit beginning and end. The explicit value domain for each type of sound shall be specified by a suffix, e.g., sound-wav.

text (txt): An alphanumeric string (formatted or unformatted), e.g., a street name or the contents of a document, message, or other alphanumeric string. The explicit value domain for “text” is the ANSI236 character set.

time-local (tm-lcl): A local time at a location in hours, minutes, and seconds optionally to ten-thousandths, in the form hhmmss.ssss.

time-ordinal-seconds (tm-ordnl-scnds): A quantity of time in seconds relative to a specific start or reference time in the form [-]ssssssssss.

time-period-seconds (tm-prd-scnds): A portion of time between two time-points measured in seconds to the optional tenths in the form ssssssss.s.

time-UTC (tm-UTC): The current clock time using the time scale maintained by the International Time Bureau that forms the basis of a coordinated dissemination of standard frequencies and time signals in hours, minutes, and seconds optionally to ten-thousandths ZULU, in the form hhmmss.ssssZ, e.g., “104539.6002Z”.

The value domain term time-UTC shall refer to the format for time specified in ANSI NCITS 3.310, *Representations of Time for Information Interchange*, i.e., HHHHMMSS.s [+/-] hhhh, where HHHH represents the hour (in the 24 hour method), MM represents minutes, SS represents seconds, ssss represents decimal seconds up to ten thousandths, and hhhh represents hours off set (plus or minus) from Greenwich Mean Time. This value domain specification is the same as that specified in ISO/IEC 8601-2000, *Data elements and interchange formats—Information interchange-Representation of dates and times*, Clause 5.3, Dates, Subclause 5.3.4.2, Local time and the difference with Coordination Universal Time—Basic format; together with Subclause 5.3.1.3, Representation of decimal fractions, a) A specific hour, minute, and second and a decimal fraction of a second—Basic format.

year (yr): A specific year in the Gregorian calendar presented in four digits in the form YYYY.

APPENDIX 3.

WRITING GOOD DEFINITIONS

Definition: A word or phrase expressing the essential nature of a person or thing or class of persons or things; an answer to the question "what is x?" or "what is an x?"; a statement of the meaning of a word or word group. [Webster's Third New International Dictionary of the English Language Unabridged, 1986]

The purpose of a data element definition is to define a data element with words or phrases that describe, explain, or make definite and clear its meaning. *Precise* and *unambiguous* data element definitions are one of the most critical aspects of ensuring data shareability. When two or more parties exchange data, it is essential that all be in explicit agreement on the meaning of that data.

ISO/IEC CD 11179-4⁷ provides a guide for writing good data element definitions. There are mandatory **rules** with which all definitions must comply, and there are **guidelines** that should be followed when writing a definition. Note the difference between rules and guidelines: compliance with the rules can be objectively tested, whereas compliance with the guidelines can only be evaluated subjectively. Many of the rules and guidelines cited below are abstracted from this document.

Although ISO/IEC 11179-4 rules and guidelines pertain to data elements and other administered components like data element concepts and value domains, they can also be applied when writing definitions for data constructs such as entities, relationships, attributes, object types (or classes), objects, segments, composites, code entries, messages, classification scheme items, XML tags, etc.

Rules for Writing Good Definitions

A data element definition *shall*:

1. Be stated in the singular.
2. State what the concept is, not only what it is not (i.e., never exclusively in the negative).
3. Be stated as a descriptive phrase or sentence(s).
4. Contain only commonly used abbreviations.
5. Be expressed without embedding definitions of other data elements or underlying concepts.

Descriptions and examples of each rule are provided below. Note that the data elements used in the examples have been named according to the FAA Data Registry naming conventions.

1. State it in the singular.

The concept expressed by the definition shall be stated in the singular. (An exception is made if the concept itself is plural.)

Example: "ARTICLE_Reference_number"

Good: A reference number that identifies an article.

Poor: A reference number that identifies articles.

⁷ ISO/IEC Committee Draft 11179-4, Part 4: Rules and guidelines for the formulation of data definitions, January 29, 2002

Reason: The poor definition uses the plural word "articles," which is ambiguous since it could imply that an "article number" refers to more than one article.

2. State what the concept is, not only what it is not.

A definition cannot be constructed exclusively by saying what the concept is not.

Example: "FREIGHT_Cost_amount"

Good: Cost incurred by a shipper in moving goods from one place to another.

Poor: Cost not related to packing, documentation, loading, unloading, and insurance.

Reason: The poor definition does not specify what is included in the meaning of the data.

3. Use a descriptive phrase or sentence.

A phrase or sentence is necessary to describe the essential characteristics of the concept. Simply stating the name as a synonym, or restating it with the same words, is not sufficient. If more than one descriptive phrase is needed, use complete grammatically correct sentences.

Example: "WEATHER_Forecast_text"

Good: An estimation or calculation of future weather conditions.

Poor: A weather prediction.

Reason: The poor definition is just a synonym for the name of the concept.

4. Use commonly understood abbreviations.

Understanding the meaning of an abbreviation or acronym is usually confined to a certain environment. In other environments, the same abbreviation can cause misinterpretation or confusion. Exceptions may be made for common abbreviations such as "i.e." and "e.g." or if an abbreviation is more readily understood than the full form and has been adopted as a term in its own right, such as RADAR (radio detecting and ranging). When an acronym is first used in a definition, it should be expanded.

Example⁸: "elevation-MSL"

Good: The vertical distance of a point or a level on, above, or below the surface of the earth, measured from the earth's mean sea level (MSL) datum.

Poor: The vertical distance from MSL to a specific point.

Reason: The poor definition is unclear because the acronym MSL is not commonly understood and some users may need to determine what it represents. Without the full word, finding the term in a glossary may be difficult or impossible.

⁸ This is an example of a value domain, i.e., a set of valid values for one or more data elements.

5. Avoid embedded definitions.

The definition of a second concept should not appear in the definition proper of the primary concept. Definitions of terms should be provided in an associated glossary. If the second definition is needed, it may be appended.

Example: “ACCIDENT_AircraftDamage_code”

Good: A code that designates the level of damage sustained by the aircraft as a result of the accident.

Poor: A code that designates the level of damage sustained by the aircraft as a result of the accident. An aircraft accident is an occurrence associated with the operation of an aircraft that takes place between the time any person boards the aircraft with the intention of flight and the time all such persons have disembarked, and in which any person suffers death or serious injury, or in which the aircraft receives substantial damage.

Reason: The poor definition contains a concept definition, which should be included in a glossary.

Guidelines for Writing Good Definitions

Highly recommended guidelines are principles that should be followed when writing a data element definition.

A data element definition should:

1. State the essential meaning of the concept.
2. Be precise and unambiguous.
3. Be concise.
4. Be able to stand alone.
5. Be expressed without embedding rationale, functional usage, domain information, or procedural information.
6. Avoid circular reasoning.
7. Use the same terminology and consistent logical structure for related definitions.

Descriptions and examples of each guideline are provided below. Note that the data elements used in the examples have been named according to the FDR naming conventions.

1. State the essential meaning.

Include all primary aspects of the concept, but avoid non-essential characteristics.

Example. “INVOICE_Total_amount”

Good: The total sum charged on an invoice.

Poor: The total sum of all chargeable items mentioned on an invoice, taking into account deductions on one hand, such as allowances and discounts, and additions on the other hand, such as charges for insurance, transport, handling, etc.

Reason: The poor definition includes extraneous material.

2. Be precise and unambiguous.

The exact meaning and interpretation should be apparent from the definition. A definition should be clear enough to allow only one possible interpretation.

Example: “SHIPMENT_Receipt_date”

Good: The date on which a shipment is received by the receiving party.

Poor: The date on which a specific shipment is delivered.

Reason: The poor definition does not specify what determines a "delivery." "Delivery" could be understood as either the act of unloading a product at the intended destination or the point at which the intended customer actually obtains the product. It is possible that the intended customer never receives the product that has been unloaded at his site or the customer may receive the product days after it was unloaded at the site.

3. Be concise.

The definition should be brief and comprehensive. Extraneous qualifying phrases such as “terms to be described” or “for the purposes of” are to be avoided.

Example: “CASEFile_NASChangeProposal_identifier”

Good: A unique identifier assigned to a case file by the National Airspace System Configuration Control Board.

Poor: The case file NCP identifier is an identifier assigned to a case file by the National Airspace System Configuration Control Board for the purpose of NAS CCB administrative procedures or for use in retrieving case file information from the FAA Data Registry.

Reason: In the poor definition, the name of the data element is repeated unnecessarily, and the phrases after “...Control Board” are extraneous qualifying phrases.

4. Make it stand alone.

The meaning of the concept should be apparent from the definition. Additional explanations or references should not be necessary to understand the meaning of the definition.

Example: “ACCIDENT_LocationCity_name”

Good: Name of the city nearest to the accident site.

Poor: See “event site” in FAA Order 8020.11.

Reason: The poor definition does not stand alone, but requires the aid of a second definition (event site) to understand the meaning of the first.

5. Express it without embedding rationale, functional usage, domain information, or procedural information.

Reasons as to why the definition is expressed a certain way should not be included in the definition. Functional usage (e.g., “this data element should not be used for...”) or procedural aspects (e.g., “this element is used in conjunction with element X...”) are more properly handled in the FDR as comments or related data references.

Example: “ACCIDENT_MidairCollision_indicator”

Good: A code that indicates whether or not the accident involved a midair collision between two aircraft.

Poor: A code that indicates whether or not the accident involved a midair collision between two aircraft. This element is used to count collisions in the air, not on the ground and not with objects (towers).

Reason: Remarks about functional usage (i.e., “this data element is used to count...”) should be omitted from the definition. If this information is needed, it should be entered as a comment.

6. Avoid circular reasoning.

Two definitions should not be defined in terms of each other. A definition should not use the definition of another concept as its definition.

Example: “EMPLOYEE_Identification_number” and “EMPLOYEE” (object class)

Poor: EMPLOYEE_Identification_number – a number assigned to an employee.

Poor: EMPLOYEE – a person who has been assigned an employee identification number.

Reason: Each definition refers to the other for its meaning. The meaning is not given in either definition.

7. Be consistent.

Use the same terminology and syntax (i.e., consistent logical structure) for similar or related definitions to facilitate understanding.

Example: “GOODS_Dispatch_date” and “GOODS_Receipt_date”

Good: GOODS_Dispatch_date – The date on which goods were dispatched by a given party.

GOODS_Receipt_date – The date on which goods were received by a given party.

Poor: GOODS_Dispatch_date – The date on which goods were dispatched by a given party.

GOODS_Receipt_date – The date on which the customer received the merchandise.

Reason: Users may wonder whether some difference is implied by the use of synonymous terms and variable syntax.

Other Good Practices

1. Begin a data element's definition by stating its representation class.

Since a data element always includes representation, begin the phrase that defines the data element by stating the representation class for the data element and its value domain. The definite article "the" is used because the definition refers to a specific data value. For example,

Name: The name of....

Code: The code that represents....

Text: The text that describes (or defines)....

Number: The number assigned by (Dun & Bradstreet, Chemical Abstracts Service, the state) to identify a (business establishment, chemical substance, legislative district)....

OR

The number that represents....

Quantity: The (sum, dimension, capacity, amount) of.... Note that instead of repeating the term "quantity" in the definition, more specific terms are used to describe the type of quantity for which the data element is applicable. This avoids the wordiness of a phrase like "The quantity that indicates the sum of...."

The definition should not begin with an expression such as "term used to describe" or "term denoting," nor should it take the form "is....," "means....," "one of..."

2. Cite the source of the definition

If the definition has been taken from another document, add a reference to it in square brackets after the definition, e.g., [ISO 690].

APPENDIX 4.

Outline for Working Group Terms of Reference (ToR)

(Name of Working Group)

Proposed Terms of Reference

(Once approved by NIAC, “Proposed” will be removed)

(Date)

Background

Provide a one-paragraph summary of the relevant issue(s) that are the basis for specifying a Working Group.

Scope

Provide a concise statement of the problem and work that will be pursued by the Working Group with appropriate boundaries to the problem. Include approximate time frame for the work of the Working Group.

Working Group Action Plan

Provide, in summary form, the task elements that will be the basis for the Working Group’s activities over the term of the Working Group’s charter.

Product Schedule

State the intended products, such as case file package, briefings, reports, etc., that will be produced and delivered by the Working Group. Specify the approximate date of delivery for each item.

Working Group Membership

Identify the Organizations that will provide members, and the names of those individuals. Identify the Chairperson(s) for the Working Group.

Note: Terms of Reference will be a NIAC agenda item, and the minutes of the NIAC forum/meeting addressing the creation of a Working Group will explicitly record the conclusions. The approval of the ToR will be considered a formal recommendation of the NIAC, thereby requiring the signatures of the NIAC Co-Chairpersons.

SAMPLE:

Aircraft Categorization and Identification Standard Working Group
Terms of Reference
July 26, 2001

Background

Currently various aviation organizations provide a system in which an aircraft is identified or grouped with similar aircraft. For example, International Civil Aviation Organization (ICAO) Document 8642/28, *Aircraft Type Designators*, lists aircraft type designators used by air traffic control systems throughout the world. The Federal Aviation Administration (FAA) lists approved aircraft type designators in FAA Order 7110.65, *Air Traffic Control*. National aviation authorities (NAA) register aircraft; however, these aircraft registries do not use the same identification systems. Aircraft accident investigators also identify aircraft involved in aircraft accidents. The aircraft identification system used by an aircraft accident investigation organization is not necessarily the same as the aircraft identification system used by that country's NAA.

A standard format in which an aircraft is identified or grouped with similar aircraft responds to Recommendation 1.8.3 of the White House Commission on Aviation Safety and Security. This recommendation directed the FAA to “work with the aviation community to develop standard databases of safety information that can be shared openly.”

A grouping based on the aircraft manufacturer, make, model, series, or category (e.g., fixed wing) assists in the air traffic control, aircraft registration, aircraft certification, accident and incident investigation, safety analysis, and other functions. In addition, standards to uniquely identify an individual aircraft would also assist these functions. Existing aircraft unique identification methods (i.e., aircraft tail number and aircraft serial number) fail the exclusivity test—i.e., duplicate serial numbers and registration numbers appear for more than one aircraft.

Many aviation functions use standardized aircraft groupings and individual aircraft identifiers:

Accident/Incident Investigation	Airworthiness Directives
Air Traffic Control	Climb and Descent Instructions
Aircraft Certification	Flight Planning
Aircraft Maintenance	Personnel Licensing
Aircraft Manufacturing	Runway Selection
Aircraft Registration	Safety Analysis
Aircraft Separation	Safety Inspection
Airport Planning	Search and Rescue

Many types of organizations use standard aircraft groupings and individual aircraft identifiers:

Air carriers	Aviation industry foundations, associations, and similar organizations
Air traffic control providers	Commercial Airline Guide Companies
Aircraft insurers	Government organizations that certify and inspect aircraft
Aircraft vendors	Government organizations that register aircraft
Aviation application developers	Accident investigation boards
Aviation historical societies	Manufacturers of new aircraft
	Conformers that modify existing aircraft

More uniform standard aircraft groupings and individual aircraft identifiers will:

- Overcome difficulties in merging data from diverse information systems (e.g., international and domestic sources or public and private sources).
- Reduce costs to merge and transform aircraft data.
- Enlarge the range and depth of aircraft information available for analysis.
- Reduce duplicate or multiple identifiers for the same aircraft, which increases the integrity of information available.
- Establish more useful and meaningful data that is defined and managed consistently.

Scope

The scope of this effort is to develop data standards (including lists of valid values) for aircraft categories and identifiers that are used in National Airspace System (NAS) operations, aircraft registration and certification, accident and incident investigation, safety analysis, and other functions. At a minimum, the following standards will be developed:

- Aircraft manufacturer
- Aircraft make
- Aircraft master model
- Aircraft model
- Aircraft master series
- Aircraft series
- Aircraft category (such as rotorcraft)
- Aircraft sub-category (such as helicopter or gyroplane)
- Unique aircraft identifier
- Aircraft serial number

Types of aircraft that the Working Group will address include:

- Any aircraft built for civilian use whether that aircraft is still in active service or not.
- Military aircraft that meet one of the following criteria:
 1. Excessed or released by military organizations for civilian use.
 2. Modified by manufacturers or others for civilian use.

3. Stored or display as of part of a museum or historical collection.
4. Involved in an aviation accident or incident that (a) was investigated by a civil organization using ICAO international standards and recommended practices for Aircraft Accident and Incident Investigation (Annex 13) and (b) where the authorities obtained and released the manufacturer, model, and serial number of the aircraft.
5. Registered by a military organization with a civilian authority such as the FAA.

The aircraft identifiers and categories established by this Working Group will be presented to the NAS Configuration Control Board (CCB). The Working Group intends for these standards to become an FAA-wide standard adopted for all new FAA systems.

Action Plan

The Working Group members will:

- Determine if additional organizations and personnel should be contacted as a source of information.
- Review products developed by the International Aircraft Categorization and Identification Standard Sub-Team of the Commercial Aviation Safety Team (CAST)/ICAO Common Taxonomy Team.
- Research and review other efforts to establish an aircraft identifier or categories. Examples of other efforts include products developed or employed by:
 - Safety Performance Analysis System (SPAS)
 - FAA's Civilian Aviation Registry, Aircraft Registration Branch (AFS-750)
 - FAA's Office of System Safety (ASY)
 - Air Traffic Control Organizations (e.g., FAA's Air Traffic Services (ATS) or Eurocontrol)
 - Bureau Veritas
 - Transport Canada
- Determine if any modifications are necessary to the products developed for other standardization efforts.
- Determine the FAA offices that will develop and/or maintain the identifiers and categories.
- Develop additional items necessary for presenting the proposal to the NAS CCB.

Product Schedule

- Register proposed data elements that record standard aircraft groupings and individual aircraft identifiers with associated data models, business rules, and specific valid values in the FAA Data Registry (FDR).
- Any other material required for NAS CCB.
- Register *initial* data elements in the FDR by September 28, 2001.

Membership

NAME	ORGANIZATION
Jana L. Hammer	AFS-750
Richard Y. Jordan	VNTSC
Deborah Kane	Advanced Management Technology Inc.
Chris Metts	ATP-110
Patrick Mills paw	ATP-110
Joseph Mooney	AAI-220
Ava Thompson	AFS-751
Robert Toenniessen	ASY-100

Approval

Signature on File
NIAC Co-Chair
Tom Fulcher, AIO-300

Signature on File
NIAC Co-Chair
Dick Powell, ATA-100

Signature on File
NIAC Co-Chair
Bennie Sanford, AUA-6

APPENDIX 5.

PROPOSAL PACKAGE SAMPLE

Case file development is a sequence of activities to compile and package the essential data and information about a set of candidate data elements or concepts. The following are typical components of a case file package:

- Case file/NCP form & Work Sheet (Form 1800-2)
- Tab A Proposed Data Standard
- Tab B Legacy Data Assessment
- Tab C Collaboration Report (generated from CDIMS)
- Tab D Data Requirements Documentation
- Tab E Data model Entity-Relations (ER) Report

5.1 Case File/NCP Form 1800-2

The case file/NCP form and associated instructions on how to fill out this form are available on the Internet at the [Configuration Management](#) web site.

The case file number can be requested from the NIAC Executive Secretary. Examples of completed case file/NCP forms are available at the [NIAC](#) web site.

5.2 TAB A Proposed Data Standard

Tab A is mandatory and is the most important piece of the case file package since it contains specifications (i.e., metadata) of the individual data standards proposed by the case file. When a data standard is approved, these specifications will become part of FAA-STD-060, *Data Standard for the National Airspace System*. Developers will be required to comply with the specifications when they build the interfaces between future applications that share the standardized data elements. Each data standard specification in Tab A consists of a subset of the metadata attributes listed in Appendix 1. The report template and accompanying developer compliance requirements are shown below.

DATA ELEMENT STANDARD

Data Identifier:

Version:

Descriptive Name:

Abbreviated Name:

Definition:

[Space is dynamically allocated to accommodate the full text of the definition.]

Data Type:

Data Type Definition:

Permissible Values:

Value Meanings:

(for enumerated value domains)

[Space is dynamically allocated to accommodate the number of permissible values.]

Value Domain Definition:

(for non-enumerated value domains)

[Space is dynamically allocated to accommodate the full text of value domain definition.]

Maximum Length:

Interchange Format:

Character Set:

Unit of Measure:

Unit of Measure Definition:

Low Value:

High Value:

Informative Meta-Attributes

Component Type:

Example:

Steward Organization:

Effective Date:

End Date:

Comments:

Developer Compliance Requirements

Meta-Attribute	Definition	Compliance Requirement
Mandatory		
Data Identifier	A language independent identifier of the data element that, together with its Version, uniquely identifies it in the FAA Data Registry (FDR).	Developers will specify data identifier, version, and descriptive name in data requirements specifications.
Version	An identification of the latest or previous update in a series of evolving data specifications within the FDR.	Developers will specify data identifier, version, and descriptive name in data requirements specifications.
Descriptive Name	A single or multiple word meaningful designation assigned to the data element.	Developers will specify data identifier, version, and descriptive name in data requirements specifications.
Definition	A natural language textual statement that expresses the essential nature of the data element specified in the standard and permits its differentiation from all other data elements.	When data definitions are included in applications, the definition will be used as is without modifications of any kind.
Abbreviated Name	A shortened form of the descriptive name of the data element.	Developers will use the abbreviated name in program code and databases for message exchange variables or fields, unless the code language or Data Base Management System (DBMS) name length limitations preclude their use. See <i>Naming and Abbreviation Conventions for Data Elements and Their Components</i> for guidance on shortening the abbreviated name.
Data Type	A single or multiple word designation assigned to a data type associated with a data element's value domain. Examples of data types are binary, bitmap, Boolean, date, real, integer, string, time. See FDR for additional information.	Developers will not use data types other than the one specified for a particular data element's value domain.
Data Type Definition	A statement that expresses the essential nature of a data type associated with a data element's value domain, and permits its differentiation from all other data types.	Developers will conform to the form of the data type specified in its data type description.
Permissible Values	The set of representations of allowable instances of an enumerated value domain of a data element, represented according to the interchange format, data type, and maximum length constraints. The set of representations of permissible instances is associated with one set of value meanings . The set can be specified by name (e.g., Postal U.S. State Codes), reference to a source, enumeration of the instances' representations (e.g., AL, AK, etc.), or rules for generating the instances.	Developers will use the permissible value and value meaning pairs exactly as is, without changes of any kind, whether they are explicitly identified or identified by reference to the source.

Meta-Attribute	Definition	Compliance Requirement
Mandatory		
Value Meaning	A statement that expresses the essential nature of a set of permissible values without a specific representation, and permits its differentiation from all other sets. The set can be specified by name (e.g., the states of the United States), or enumeration of the meanings of each permissible value (e.g., the state of Alabama, the state of Alaska, etc.).	Developers will use the permissible value and value meaning pairs exactly as is, without changes of any kind.
Value Domain Definition	A description of a value domain that does not have an explicit set of values, i.e., is not an enumerated value domain. Example: “a string of alphanumeric uppercase characters, including dashes, periods or spaces.”	Developers will conform to the specified form of the value domain definition for non-enumerated value domains.
Maximum Length	The maximum number of storage units (of the corresponding data type) needed to represent a data element.	Developers will not exceed the maximum length.
Interchange Format	A single or multiple word designation assigned to a form of interchange for a data element, that permits its differentiation from all other interchange formats, e.g., YYYYMMDD for calendar date, where YYYY represents a year, MM represents an ordinal numbered month in a year, and DD represents an ordinal numbered day of a month.	Developers will comply with the form of interchange specified for data element interchanges between systems and should use that form in application code and databases where possible.
Character Set	A set of graphic symbols (e.g., hieroglyphics or letters) used in writing or printing, e.g., ASCII, Unicode.	Developers will use the character set specified.
Unit of Measure	A single or multiple word designation assigned to a measurement framework for data elements with representational forms of quantity, e.g., watt, mile, miles-per-hour, ton, ampere.	Developers will not use units of measure other than the one specified for a particular data element. Note: this meta-attribute applies only to quantity-oriented data elements.
Unit of Measure Definition	A statement that expresses the essential nature of a measurement system associated with a data element and permits its differentiation from all other units of measure.	Developers will conform to the form of measurement unit specified in its unit of measure description. Note this meta-attribute applies only to quantity-oriented data elements.
Low Value	The smallest permissible value for data elements with representational forms of quantity.	Developers will constrain data element permissible value to be within high and low values specified.
High Value	The largest permissible value for data elements with representational forms of quantity.	Developers will constrain data element permissible value to be within high and low values specified.

Meta-Attribute	Definition	Compliance Requirement
INFORMATIVE	The following meta-attributes provide additional information to developers.	
Component Type	The type of data component as managed in the FDR, e.g., data element, value domain, object class.	N/A
Example	A representative sample of an instance of the data element.	N/A
Effective Begin Date	The date that a data standard is approved for use.	N/A
Effective End Date	The date that a data standard is no longer approved for use.	N/A
Steward Organization	The organization that has responsibility for the quality of meta-attribute contents for a data element.	N/A
Comments	Additional explanatory information.	N/A

5.3 TAB B Legacy Data Assessment

This section details the proposed data standard's relationship with or potential impacts on those other similar data elements in use in associated systems. The owners of these systems are stakeholders in the data standardization process.

The case file initiator (Working Group or individual) is expected to conduct as part of the research effort a broad search across a majority of the FAA systems to determine what equivalent data elements are in use by the various systems. This search may extend to international registries.

The following table is a sample that can be used to demonstrate the type of information needed. The left column shows the proposed standard data element by its descriptive name.

Example Related Data Report

Proposed Standard	Legacy Information	
Data Element Name	Old Data Element Name	Associated Systems
AIRPORT_Location_identifier-ICAO	Airport-ID	System A Interface Requirements Document (IRD)
	AIRPORT	System A
	Airport_Identification	System B IRD
	Apt_ID	System C
	APT_ID	System D IRD
	APT_IDENT	System E
	Facility_ID	System F IRD
	FAC_ID	System F
	Facility_Identification	System G
	AERODROME	System H

The legacy information is shown in the table as the old data element name and associated system. As the MDR becomes populated with baseline metadata about these systems, it will become feasible to extract this from the MDR.

5.4 TAB C CDIMS Report

Working Groups are encouraged to utilize NIAC's collaborative discussion tool, [CDIMS](#), to support their collaboration activities. CDIMS is capable of documenting issues raised during the development of the data element standards and of producing a summary report that can be added to the case file package. The objective of this report is to categorize the issues raised in the standards consensus debate, reveal the participants' voting and method of closure of the issue, and show the LOB participation in the process.

CDIMS users play several roles, the most important being *moderator* and *collaborator*. A moderator synthesizes and presents issues to be decided, while collaborators discuss the issues and vote on them. For data standardization issues, the moderator is typically the Working Group Chair or his/her designee, and the collaborators are the Working Group members and other interested parties invited by the moderator to take part in discussions. Collaborators also represent the interest of their LOB, particularly when they cast their votes.

Attached is a CDIMS web page showing a Working Group issue and voting results. In this example, the issue happens to be a proposed revision to a document. A member submits the issue to the moderator, who opens it up to the rest of the Working Group as a relevant topic for discussion and comment. Following a period of discussion, the moderator calls for a vote. The moderator may close the discussion or promote it to other levels, e.g., to the NIAC Core Committee or Co-Chairs, for further action and/or approval. Comments are viewable in the discussion thread, a portion of which is shown in the example.

Sample CDIMS Discussion and Vote (Abbreviated)

Main Topic

Subject: **FDR Naming Conventions revision**

Message: A revision of the naming conventions document has been placed in the FDRI WG materials area. This is a substantial revision and deserves a fresh review by interested parties.

Submitted by:	Status:	Topic Area (Required):
Collaborator1 on 11/23/2001 at 03:09 PM	Closed	FDRI WG

Moderator's Synopsis of the Issue for Collaborators:

The FDR Naming Conventions document has been revised per all your comments, and the latest revision is posted under "related materials". It will be an appendix in the forthcoming NAS Data Standardization Procedures document.

Synopsis for Exec. Secy. and Core Committee:

The FDR Naming Conventions document contains all changes recommended by FDRI WG participants and is ready for review and approval.

		Voted/Approved
Commenter:	collaborator2 collaborator3 collaborator4 collaborator5 collaborator6	Agree Agree Agree Agree Agree
Executive Secretary	execsec1	Agree
Core Committee	corecomm1 corecomm2	Agree Agree

[Go to CDIMS Home](#)

▼ [Discussion Thread](#)

[\[Previous Main Document\]](#)

● [FDR Naming Conventions revision \(collaborator1\)](#) ●

.. [Value domain -- Longitude \(collaborator3\)](#)
... [longitude \(collaborator1\)](#)
.. [Physical names \(collaborator3\)](#)
... [Physical names \(collaborator2\)](#)
..... [Requirement for using names in applications and databases \(collaborator5\)](#)
.. [Revision Looks OK \(collaborator4\)](#)
.. [Unit of measure as part of the value domain term \(collaborator5\)](#)
... [UOM in value domain term \(collaborator1\)](#)
..... [My vote would be to have UOM as part of the name \(collaborator5\)](#)
..... [UOM \(collaborator6\)](#)
.
...Etc. [\[Next Main Document\]](#)

5.5 TAB D Data Requirements Documentation

Documentation of the requirement for establishing one or more data standards is a detailed activity that can be performed by searching the NAS Architecture, Capital Investment Plan, NAS-SR-1000, FAA Orders, Federal Aviation Regulations, FAA Standards, and other forms of user needs documentation that aid in creating the requirements picture. The following is an illustration of requirements documentation.

Data Elements in NIAC Case File 1	Data Element Requirements References
DE03 AIRPORT_Location_identifier-ICAO Unique location identifier that is formulated in accordance with rules prescribed by ICAO and assigned to the location of an aeronautical fixed station.	14 CFR Part 91 The point of departure. 14 CFR Part 91 (6) The point of first intended landing and the estimated elapsed time until over that point. 14 CFR Part 91 (2) An alternate airport, except as provided in paragraph (b) of this section. 14 CFR Part 91 (3) Pertinent aeronautical charts. Charts are any or all of: Sectional Aeronautical Charts, Terminal Area Charts, Regional Airport/Facility Directory, IFR Low-altitude En Route Charts, Instrument Approach Charts. FAA Order 7110.65 6. Point of departure. FAA Order 7110.65 8. Destination airport and clearance limit if other than destination airport.

5.6 TAB E Logical Data Model

Data modeling is an important part of gaining an understanding of the nature of the proposed data elements and how they interrelate. A logical data model may also become a starting point for creating a physical model to analyze systems engineering issues that are not presently a standardization concern but represent evolutionary change in information flows. Models may be represented in any standard notation, such as Entity-Relationship Diagram (ERD) or Unified Modeling Language (UML). See the [FAA Data Modeling Process V1.1](#) document for more information.

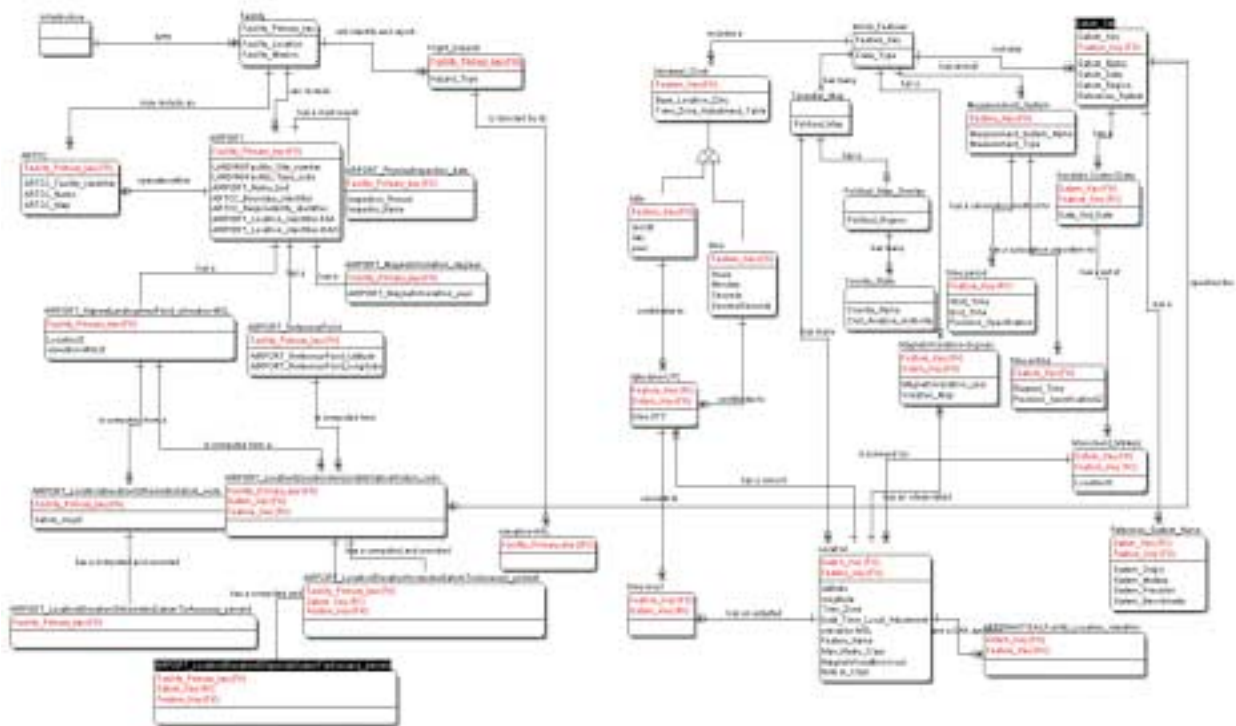


Figure A5-1: Example Logical Data Model

REFERENCES

Name	Web Link
Capability Architecture Tool Suite – Internet (CATS-I)	http://www.nas-architecture.faa.gov/CATS/CATSI.cfm
Capital Investment Plan (CIP)	http://nasdocs.faa.gov/
Collaborative Data Integration Management System (CDIMS)	http://callisto.cdims.act.faa.gov/
Document Control Center	http://www.faa.gov/cm
DOD 8320.1-M-1, Data Standardization Procedures, April 1998	http://www-datadmn.itsi.disa.mil/8320_1m1.html
FAA Acquisition Management System (AMS)	http://fast.faa.gov/
FAA Acquisition System Toolset (FAST)	http://fast.faa.gov/
FAA Data Registry (FDR)	http://fdr.faa.gov/
Data Element Registry's User Guide and Reference v1.0, Oracle Corporation	http://fdr.faa.gov/ (integrated in FDR user help)
FAA Data Architecture V1.1	http://intranet.faa.gov/aio/data_arc/
FAA Data Modeling Process V1.1	http://intranet.faa.gov/aio/data_arc/
FAA Metadata Repository (MDR)	http://mdr.faa.gov/
FAA-STD-025, <i>Preparation of Interface Documentation</i>	http://nasdocs.faa.gov/
FAA-STD-060, <i>Data Standard for the National Airspace System</i>	http://www.tc.faa.gov/act-500/nseb/niac/
FAA Order 1375.1C, <i>Data Management Policy</i>	http://www.faa.gov/aio/common/documents.htm
ISO/IEC 11179 Metadata Registry Implementation Coalition	http://hmrha.hirs.osd.mil/mrc/

Name	Web Link
ISO/IEC 11179 standard (ISO = International Organization for Standardization, IEC = International Electrotechnical Commission) <i>Information Technology - Specification and Standardization of Data Elements, Parts 1 – 6</i>	Copies of ISO standards can be obtained electronically from the Web site http://webstore.ansi.org/ansidocstore/shopper_lookup.asp . Paper standards are available through Global Engineering Documents, 15 Inverness Way East, Sales – C303B Englewood, CO 80112-9649, Telephone: (800) 854-7117, FAX (303) 397-2740 or at the Web site http://global.ihs.com/ .
National Airspace System (NAS) Architecture	http://www.faa.gov/nasarchitecture/
<i>NAS Data Classification Scheme</i> (MTR 00W0000067), Broste, Rhoades, Schwarz; The MITRE Corporation, September 2000	http://www.tc.faa.gov/act-500/nseb/niac/
NAS Configuration Control Board (NAS CCB) Charters	http://www.faa.gov/cm/charters.htm
NAS Information Architecture Committee (NIAC)	http://www.tc.faa.gov/act-500/nseb/niac/
NAS Configuration Control Board (NAS CCB) Operating Procedures	http://www.faa.gov/cm/charters.htm
NAS Information Architecture Committee (NIAC) Charter	http://www.tc.faa.gov/act-500/nseb/niac/
NAS Information Architecture Committee (NIAC) Operating Procedures	http://www.tc.faa.gov/act-500/nseb/niac/
NAS-SR-1000 – NAS Level Requirements	http://nasdocs.faa.gov/
NAS-DD-1000 – NAS Level I Design Document	http://nasdocs.faa.gov/
NAS-SS-1000 – NAS System Specification	http://nasdocs.faa.gov/
Office of Information Services/CIO (AIO)	http://www.faa.gov/aio/

DEFINITIONS

Attribute	A property or characteristic that is common to all instances of an entity. [DoD 8320.1-M-1]
Business Rule	A statement of fact that identifies constraints governing the business functions and information requirements of an enterprise. [DoD 8320.1-M-1]
Data	Representation of facts, concepts, or instructions in a formalized manner suitable for communication, interpretation, or processing by human or automated means. [FAA-STD-060]
Data Architecture	The data architecture depicts the distribution and access mechanisms associated with data for one or more applications. IT defines the standard and procedures needed to create consistent, accurate, complete, and timely data. It defines a process for rationalizing data needs across applications and determining its appropriate distribution and placement. It defines the methods for the collection and distribution of all computerized information. [FAA Data Architecture V1.1]
Database	A collection of data items that have constraints, relationships, and schema. A collection of interrelated files stored together, where specific data items can be retrieved by various applications. A collection of data arranged in groups for access and storage. [FAA Data Architecture V1.1]
Data Element	A basic unit of identifiable and definable information that occupies the space provided by fields in a record or blocks on a form. A data element has an identifying name and value or values for expressing specific facts. [FAA-STD-060]
Data Model	A representation of the things of significance to an enterprise and the relationships among those things. It portrays the underlying structure of the enterprise's data, so this can then be reflected in the structure of databases built to support it. [DoD 8320.1-M-1]
Data Registry	A tool that supports the registration and standardization of data elements and other administered components by recording and disseminating data standards, which facilitates data sharing among organizations and users. A data registry provides users of shared data a common understanding of a data element's meaning, attributes, and unique identification. Approved data standards in the registry will be used by information systems developers to enable data sharing. [FAA-STD-060]

Data Steward	A Data Steward manages the development, standardization, and certification of data within an assigned area of responsibility. A Data Steward is responsible for the accuracy, reliability, quality, and currency of descriptive information (metadata) about data in an assigned area of responsibility. [FAA-STD-060]
Derived Data Elements	Derived data elements represent the results of computational operations performed on other data elements. The computations may involve algorithms supported by two or more data elements within a single entity instance or algorithms summarizing data element values across multiple entity instances within a single entity or across multiple entities. [DoD 8320.1-M-1]
Entity	The representation of a set of real or abstract things (people, objects, places, events, ideas, combination of things, etc.) that are recognized as the same type because they share the same characteristics and can participate in the same relationships. [DoD 8320.1-M-1]
Information	Any communication or representation of knowledge such as facts, data, or opinions in any medium or form, including textual, numerical, graphic, cartographic, narrative, or audiovisual form. Data that have been processed in such a way that it can increase the knowledge of the person who receives it. Information is the output, or finished goods, of information systems. [Order 1375.1C]
Information System	A combination of information, computer, automation system, telecommunications resources, personnel resources, and other information technology that collects, records, processes, stores, communicates, retrieves, and displays data. [FAA-STD-060]
Life Cycle	There are two categories of life cycle: a. Data. The stages through which data pass typically characterized as creation or collection, processing, dissemination, use, storage, and disposition. b. Information System. The phases through which an information system pass, typically characterized as initiation, development, operation, termination, and decommissioning. [Order 1375.1C]
Logical Data Model	A fully attributed model of data entities that represents the meaning and relationships of data requirements that is independent of individual applications, software, and hardware constraints. [DoD 8320.1-M-1]
Metadata	Metadata includes information that describes the characteristics of data; facts or information about data; and descriptive information about an organization's data activities, systems, and holdings. [FAA-STD-060]

Metadata Repository (MDR)	An MDR is a collection of information about information systems and their data. Definitions and components of a data and information architecture are held in a metadata repository. [Order 1375.1C]
Methodology	The principles, practices, etc. of orderly thought or procedure applied to a particular branch of learning (i.e., data modeling). A set of standards and procedures used to guide the development of a data model. [DoD 8320.1-M-1]
Modeling	Application of a standard, rigorous, structured methodology to create and validate a physical, mathematical, or otherwise logical representation of a system, entity, phenomenon, or process. [DoD 8320.1-M-1]
NAS Data	NAS data are the data shared among NAS applications and specified in Interface Requirements Documents or Interface Control Documents that are configuration managed by the NAS CCB. [FAA-STD-060]
Non-NAS Data	All FAA data not specifically configuration managed by the NAS CCB. [Order 1375.1C]
Physical Data Model	A representation of the technologically independent data structures for a data base, e.g., specification of database table structures. [DoD 8320.1-M-1]
Relationship	An association between two entities or between instances of the same entity. [DoD 8320.1-M-1]
Standardization	Process of requiring applications of a standard definition and representation to a data element. [FAA Data Architecture V1.1]
Standard Data Element	A data element that has been formally approved in accordance with the Standardization procedures. Alternatively, standard data elements are data that have been coordinated through the standardization process and approved for use in information systems. [FAA-STD-060]

ACRONYMS

AMS	Acquisition Management System
ANSI	American National Standards Institute
ARTCC	Air Route Traffic Control Center
CATS-I	Capability & Architecture Tool Suite
CCB	Configuration Control Board
CCD	Configuration Control Decision
CDIMS	Collaborative Data Integration Management System
CIO	Chief Information Officer
CIP	Capital Investment Plan
CONUS	Contiguous or Conterminous United States
COTS	Commercial Off-The-Shelf
CS	Classification Scheme
CSI	Classification Scheme Item
DBMS	Database Management System
ER	Entity Relations
ERD	Entity Relationship Diagram
FAA	Federal Aviation Administration
FAST	FAA Acquisition Support Tool
FDR	FAA Data Registry
FIPS	Federal Information Processing Standards
ICAO	International Civil Aviation Organization
IDEF1X	Integrated Computer-Aided Manufacturing Definition One Extended Data Modeling Technique
IEC	International Electrotechnical Commission
IERS	International Earth Rotation Service
ISO	International Organization for Standardization
ICD	Interface Control Document
IRD	Interface Requirements Document
JTC	Joint Technical Committee
LOB	Lines of Business
MDR	Metadata Repository
MSL	Mean Sea Level
NAS	Nation Airspace System
NCP	NAS Change Proposal
NIAC	NAS Information Architecture Committee
SME	Subject Matter Expert
STARS	Standard Terminal Automation Replacement System
ToR	Terms of Reference
UML	Unified Modeling Language
URI	Uniform Resource Identifier
UTC	Universal Coordinated Time
WWW	World Wide Web